



**Royal Institute of Navigation – Nav '05  
Conference Report**

**by K A Smith**

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## 1 Introduction

The HA EU Watch Project is providing intelligence for the Highways Agency on ITS developments in Europe and is carried out by TRL on behalf of the HA. The project summarises key information for decision makers and practitioners on activities related to Intelligent Transport Systems (ITS) in Europe. The project covers specific areas of key interest to the HA. Initially these are:

- Galileo (including location-based services)
- Standards (including DATEX and location referencing)
- European ITS research projects
- European Commission activities

The Royal Institute of Navigation's annual conference took place on the 1<sup>st</sup>-3<sup>rd</sup> November 2005. The conference – "Nav '05" - concentrated heavily on the progress and future of the Galileo system.

The Russian Federation GLONASS and the American NAVSTAR systems have been providing GPS services for almost two decades. A third GPS system is, being proposed by a consortium in Europe. The Galileo GPS system would be owned and operated by Europeans and was recently supported by the European Parliament.

This report will provide a summary of the most relevant presentations that took place at the conference. Days one and two of the conference mainly focussed on road and Galileo based topics.

Presentations included information about the third call under EU Framework 6, competitions to raise the profile and use of Galileo and a study of the potential services that could be provided using Galileo signals.

## 2 Tuesday 1<sup>st</sup> November 2005

This was the first day of the conference and started with several keynote speakers, talking about the future of Galileo.

### 2.1 Are we ready? – Dr Sally Howes (Director General, SBAC)

Dr Howes, Director General of the Society of British Aerospace Companies, talked about the challenges facing Galileo:

- *Technical challenges*  
Getting the accuracy and integrity from the signal. Creating and supporting standards. Creating chips compatible with both GPS and GNSS.
- *Effective exploitation*  
From government at all levels to applications and transport systems (including road pricing).
- *Start generating revenue*  
Perhaps starting with simple applications such as traffic incident alerts.
- *Consumer acceptance*  
Research is needed to establish consumer needs, as well as the consideration of social and privacy issues ("Big Brother"). Guidelines from government could help to improve consumer acceptance. For example, CCTV was thought to be a big step towards big brother, but most people don't consider it a problem these days.
- *Systems integration*  
Combining GNSS, GPS, Bluetooth, mobile etc, for more versatile solutions.

## **2.2 Using GNSS Indoors –Gerard Lachapelle (University of Calgary)**

This presentation looked at the possible uses of GNSS, including asset tracking, personal location, and emergency service use. It was suggested that most services would benefit from a seamless switch from use outdoors to indoors, and perhaps vehicle to pedestrian.

The goals for positioning are constantly changing, with the ultimate goal perhaps being something like 10 metre accuracy within 10 seconds any time and anywhere.

Using GNSS indoors, and indeed, in urban areas (especially urban “canyons”) can be plagued by thermal noise, reflection and absorption. These problems can cause large errors. If these problems can be solved, it will lead to a highly useful system.

It was suggested, that unless an application is reliable, then it can become more of a ‘toy’. It doesn’t take long for a user to become disillusioned with an application, if it can’t find the location two or three times.

95% of Japanese cars now come off the production line already fitted with navigation systems. They are beginning to become a requirement, rather than a luxury.

## **2.3 A Government Viewpoint – Dr Stephen Ladyman (MP, DfT)**

Dr Ladyman spoke of opportunities in the maritime sector. Aeroplanes have sophisticated navigation systems; cars and road traffic are beginning to have sophisticated navigation systems. Ships continue to have ‘bolt-on’ technologies that don’t work together, along with a heavy reliance on buoys, lights and radar.

## **2.4 GNSS Update – Stephen Bayless (US Department of Transportation)**

This presentation showed the state of the current policy on GNSS in the United States. Under the new administration it has been renamed the Position, Navigation and Timing Policy.

Currently 87% of the US can see a single satellite, whilst 55% have dual coverage. The aim is to have dual coverage for 100% of the US by 2008.

Traffic solutions in the States are beginning to require better accuracy. Accuracy of around 0.15m would enable the use of collision avoidance equipment.

The US has an agreement with the EU about Galileo.

Their aim, as part of the policy, is to keep GPS level in accuracy and available with its competitors (Galileo and GLONASS) whilst still keeping GPS as a military service, in order to protect the US.

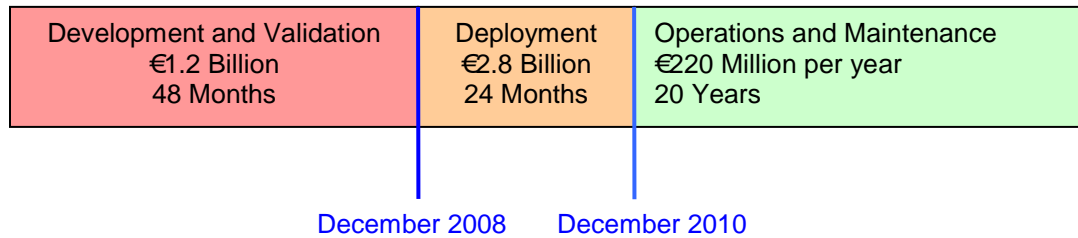
## **2.5 GLONASS – Professor Terry Moore (University of Nottingham)**

This presentation looked at the GLONASS constellation of GNSS satellites. The constellation consists of 21 satellites on three planes, with three active spares. This provides four satellite coverage for 97% of the earth. GLONASS is however, less accurate than GPS.

Professor Moore explained that over time, the number of satellites has decreased significantly, due to lack of funding, but that GLONASS was about to be updated with a selection of newer style satellites, with a number of launches in the near future.

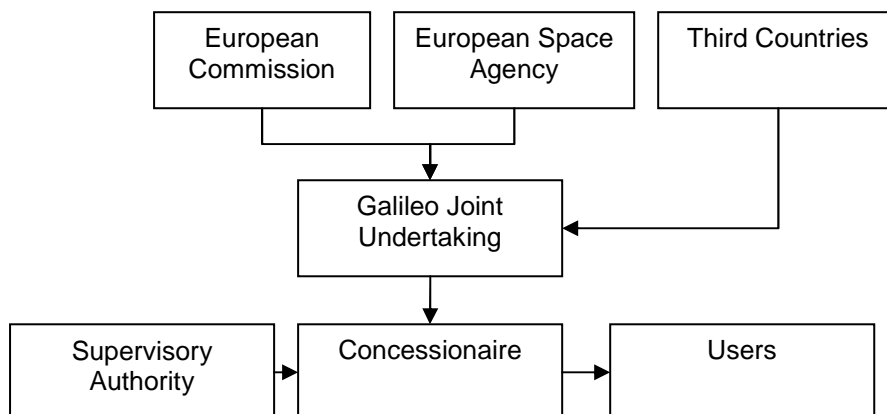
**2.6 Galileo Deployment Status – John Swann (Galileo Joint Undertaking)**

Mr Swann updated the assembly with the progress of Galileo.



Galileo is currently under development and validation and the first satellite will be launched in December 2005. Between 2008 and 2010, full deployment of the satellite constellation will be completed. Once completed, the system has a planned lifetime of at least 20 years. After full deployment the system will need to be certified for the “Safety of Life” service. A certain amount of time is required, to prove the quality and reliability of the service.

The final bid for the Galileo Concession was submitted on the 21st October 2005. The concession will work as follows:

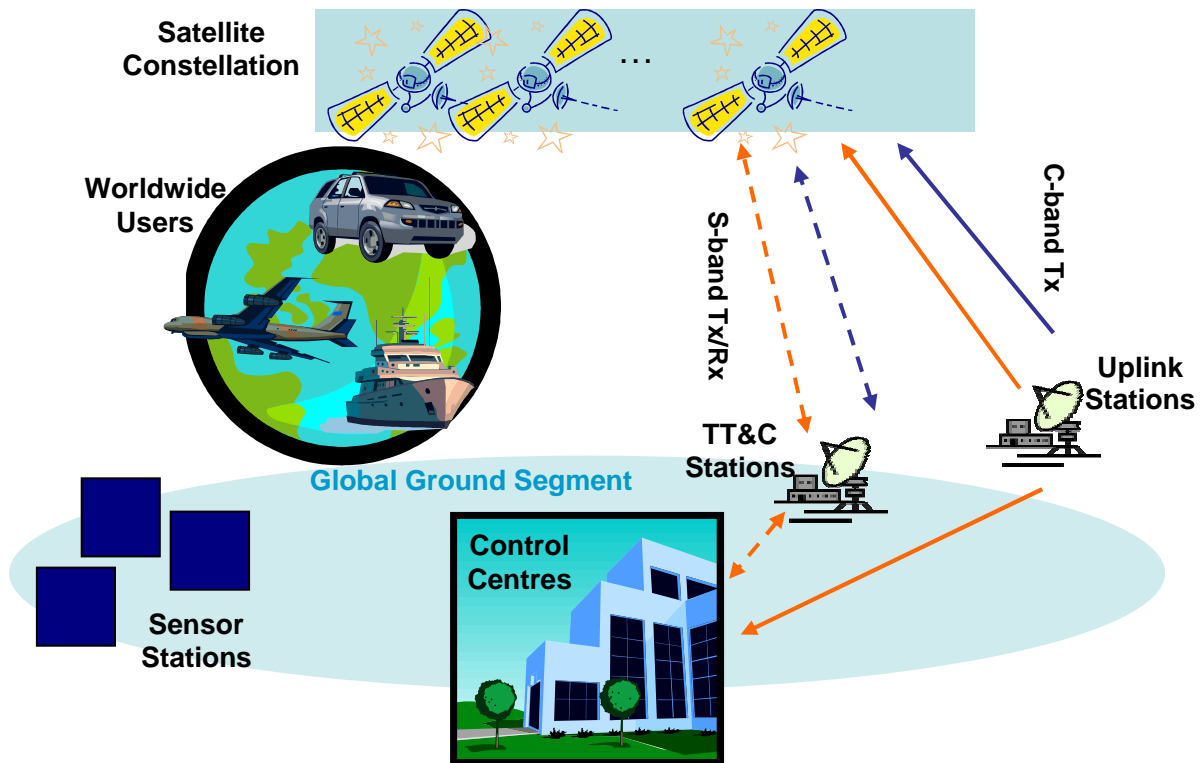


The EC Framework 6 programme is underway and expects to spend around €110 million on Galileo Research and Development. The 1st and 2nd calls were during 2004 and the third call was expected around mid November 2005.

**2.7 Galileo Status – Richard Peckham (EADS Astrium)**

This presentation gave an overview of how Galileo would work, using 30 sensor stations, 10 uplink stations, 5 TT&C stations and two control centres. The locations of these facilities are to be decided by the European Space Agency (ESA). Italy is keen to host at least one of the control centres.

The diagram overleaf shows how the Galileo system will be set up. Figures are given for the number of each piece of equipment required during both the development phase and the full deployment.



**Figure 1. Layout of the Galileo system**

	IOV Development Stage	Full Deployment
TT&C Stations (Tracking, Telemetry and Command Stations)	2	5
Uplink Stations	5	10
Control Centres	1	2
Sensor Stations	12	30

**Table 1. Number of stations/centres required during development and deployment**

EU Framework 7 will be starting in 2007. This will have a budget of €50 million.

The ESA Preliminary Authorisation to Proceed (PATP) was agreed on the 27th October 2005 and the full contract is expected to be signed in November 2005. For the contract to be granted, unanimous agreement has to be granted by the Member States. Of the money given by the Member States for the programme, at least 50% of the value must be given as work to the Member States. This has caused some hold ups, as it has meant finding work that can be done by some of the less experienced Member States.

**2.8 SSSL Galileo System Test Bed – Dr Martin Unwin (SSSL)**

Dr Unwin from Surrey Satellites Technology Limited spoke about the GSTB-V2/A satellite, which is to be launched in December 2005. This satellite is to be the first satellite in the Galileo constellation.

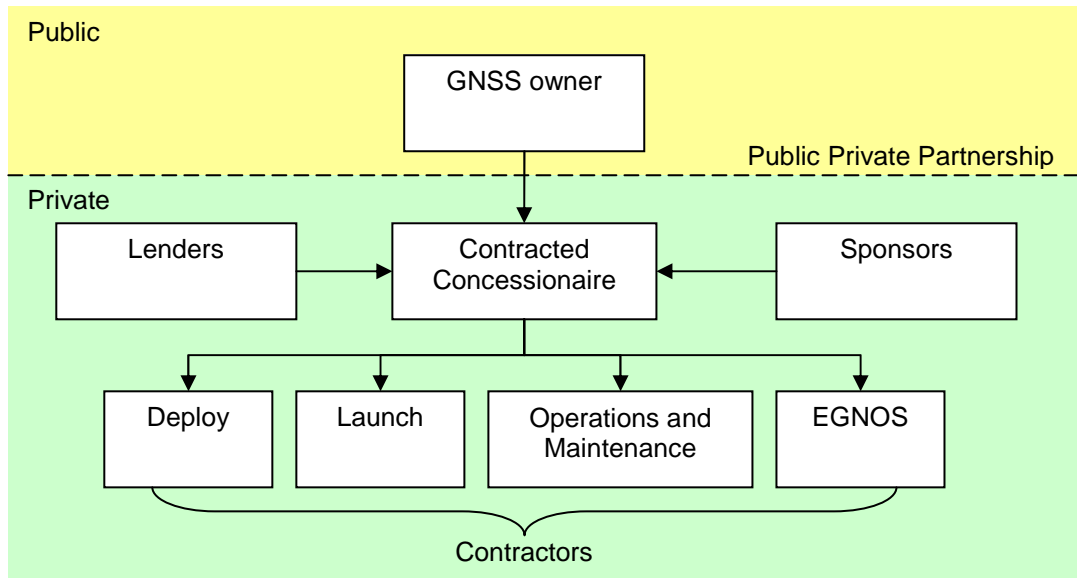
The satellite was currently undergoing its flight readiness review. The satellite will sit in orbit at a distance of 24,000 kilometres and was launched from Baikonour.

### 2.9 Galileo Concession – Lyn Dutton (Thales Avionics Ltd)

This presentation gave an update on the progress of the Galileo Concession. The satellites will produce ten signals, which will be used for the following:

- Open service
  - Commercial service
  - Safety of Life service
  - Public regulated service
  - Search and rescue service
- } Potential Revenue Streams

The concession is expected to work as follows:



Stakeholders involved in Galileo are as follows:

Stakeholder	Responsibilities
European Commission	<ul style="list-style-type: none"> <li>○ 50% sponsor to the Galileo Joint Undertaking</li> <li>○ Takes responsibility as political supervisor in the Galileo Supervisory Board – EU Member States represented with relevant national agendas</li> </ul>
European Space Agency	<ul style="list-style-type: none"> <li>○ 50% sponsor to the Galileo Joint Undertaking</li> <li>○ Takes responsibility as technical supervisor</li> <li>○ Responsible for the Development and IOV phase</li> </ul>
Galileo Joint Undertaking	<ul style="list-style-type: none"> <li>○ Responsible for the selection of the Galileo Concessionaire</li> <li>○ Will start negotiations with preferred bidder for the Concession contract</li> </ul>
GNSS Supervisory Authority	<ul style="list-style-type: none"> <li>○ Entity formed by the European Commission</li> <li>○ Will take over from GJU by 2006-01-24</li> <li>○ Will be responsible for contracting with the Concessionaire</li> </ul>
Concessionaire	<ul style="list-style-type: none"> <li>○ The two remaining bidders – iNavSat (EADS, Thales, Inmarsat) and EUrely (Alcatel, Finmeccanica, AENA, Hispasat) have submitted a joint proposal</li> <li>○ Joint proposal accepted by GJU on 27/06/2005</li> </ul>

### 3 Wednesday 2nd November 2005

#### 3.1 Preparing for Galileo Opportunities – Liz Duthie (DfT)

DfT are coordinating the UK position on Galileo. The UK objectives are to maintain the civil nature of the services and to ensure an effective public private partnership (PPP). Mrs Dunwoody set out the first objectives for Galileo in November 2004 (House of Commons, 2004).

The UK contribution to Galileo is:

- Definition                      £4.9 Million                      2002-2003
- Development (IOV)    £65 Million                      2003-2008
- Deployment Public    1/3 Private 2/3 Funding                      2007 onwards

It is visualised that GNSS will be used progressively for schemes, starting perhaps with speed limit enforcement, and working towards more technically complex applications, such as road charging.

The current EGNOS service is already being used as an augmentation service, and is free of charge. It could be certificated for aviation use, but would have to be maintained for a set number of years.

#### 3.2 Galileo Simulation Facility – Dr Frank Zimmerman (Vega IT GmbH)

Vega-group.com has created a free of charge simulation facility, which can simulate the data created by GNSS satellites. It can provide raw data, or a service volume performance analysis.

#### 3.3 Galileo Masters – Adam Tucker (HertsBIC)

This presentation gave an overview of the 2005 Galileo masters competition, which looks for ideas from European countries which can use Galileo. Over 40% of the ideas submitted were from the UK, with the rest coming from the 6 other countries.

The programme is looking for support from partners, industry and road operators to take these ideas further and help the entrepreneurs.

The winner for 2005 was introduced as Richard White from TrackerBack. TrackerBack looks to create an asset tracking service, to ensure delivery and that no fly tipping is done on the route. Registered couriers would be equipped with GNSS equipment which could track the consignment and make sure it takes the correct route.

#### 3.4 Round Table Discussion

A round table discussion took place at the conference. Several key speakers took centre stage to direct discussions. The market that they represent is shown in brackets in the list below:

- Wayne Hulls                      (CONSUMER)
- Liz Duthie                      (TRANSPORT)
- Roland Rawlings                      (AVIATION)

- Andy Maloney (COMMERCIAL)
- Lyn Dutton (CONCESSION)

Lyn suggested that one of the main commercial benefits of Galileo has probably not even been conceived yet. As an example, he explained that when mobile phones were introduced, texting was not expected to take off. There are probably uses for Galileo that won't seem important, but will take off and be a huge success.

A question was posed to the group on the lessons that can be learnt from GPS. It was felt that it should be reliable and accurate, and that new ideas would be needed, in order to gain a market place for Galileo.

### **3.5 Location-enabled journey support – Tracy Ross (Loughborough University)**

Ms Ross discussed the future of travel, and the future needs of consumers. A trial was conducted in two stages to find out what would be needed in the future.

The first trial was a real-time log, which had users between the ages of 22 and 26 using a voice recording system to record their journey and any task they had to complete on that journey. They also recalled any problems that they encountered with these tasks.

The second trial was a post-hoc recall log, which involved telephone interviews at the end of journeys. The study included users over the age of 23, who had a navigation system already in their vehicle. Again, the study asked about tasks that had to be completed on the journey, and how successfully the tasks were completed.

Greater than half of the tasks listed had some kind of location element to them (for example, if a task was to post a letter, it may include, the location of the post box on the route). Some common tasks from both trials are shown below:

- Contacting people at the destination
- Location of friends to meet up with
- Directions
- Traffic information
- Car park information – nearest available spaces
- Services information
- Weather information
- Reminders (e.g. don't forget to buy bread on the way home)
- Tags (e.g. that restaurant looks good, virtual post-it of the location)
- Laborious selection of to/from positions
- Pre-journey warnings of problems

It was clear from the studies that often, the tasks were as important as the journey. Most tasks needed a virtual 'PA' (Personal Assistant) and the ability not only to aid the journey but the planning pre-journey and tasks on arrival at the destination.

## **Bibliography**

**House of Commons Transport Committee, 17<sup>th</sup> November 2004.**  
Galileo, 18<sup>th</sup> report of session 2003-2004.

## **Glossary**

CCTV	Closed Circuit Television
EGNOS	European Geostationary Navigation Overlay Service
GNSS	Global Navigation Satellite System
GPS	Global Positioning System