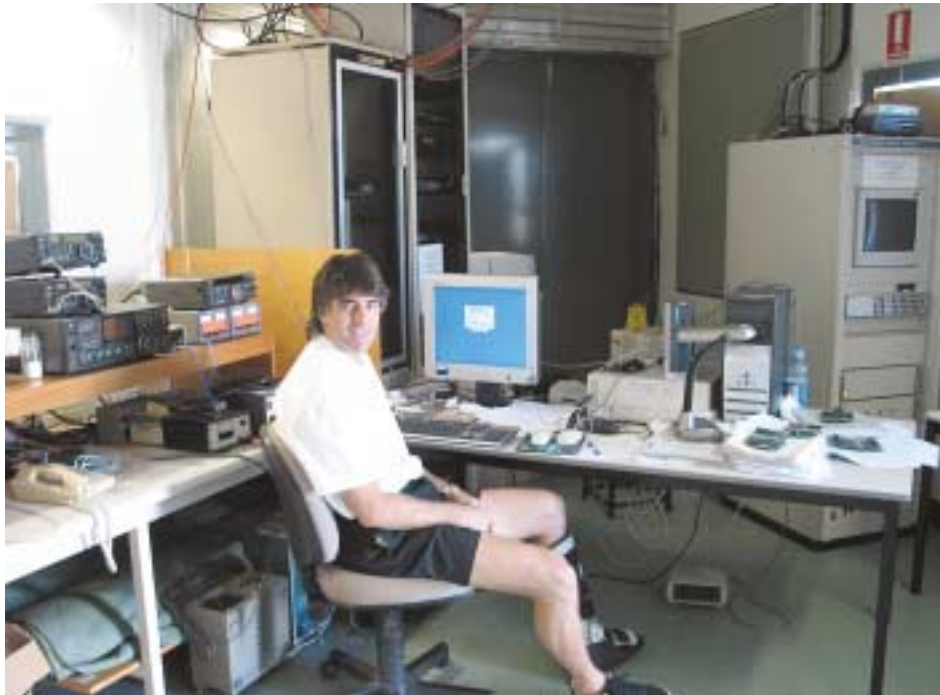


*Substantially improved reliability
and higher accuracy for machine control*

Galileo is Coming



Professor Werner Enderle moved to Australia from the German Space Agency to augment a team of GNSS experts at the Queensland University of Technology. As a representative of Germany, Werner had played a major role in the inter-European negotiations that got Galileo established.

The European alternative to GPS, carrying the name of the astronomer Galileo, will be operational in a little over three years. Survey and machine control users with access to this new constellation of satellites will benefit a great deal from improved accuracy, availability and reliability.

GPS is the name of the system operated by U.S. Air Force, but it has come to be a generic term for satellite positioning system technology. Strictly, we should start to get used to the all-embracing term GNSS (Global Navigation Satellite System).

Galileo signals will overlap GPS frequencies, but the signal structures are more complex and quite dissimilar. European transmitters will use more frequencies and greater bandwidth to achieve higher precision.

There are other important differences between the two systems, and the philosophies that underlie them. But having said that, the European Commission has aimed at compatibility and interoperability in the design of Galileo.

More Satellites will provide Greater Accuracy, Reliability

If there's been one shortcoming in its application to the guidance of earthmoving machinery, that's been a scarcity of satellites "in sight" of the GPS receivers at certain periods every day. Galileo will more than double the availability.

The positional accuracy offered by receivers is dependent both on the number of satellites, and their position in the sky. If they're well spread, the receiver is better able to resolve its geometric calculations—the outcome is higher accuracy. Too few satellites, and the resolution decays to the point that the equipment can't reliably be used until more 'birds' come into sight.

The current generation of GPS receivers will not be able to process Galileo, but all major manufacturers tell us that they are working closely with the EC towards the introduction of new Galileo-compatible models as soon as technical issues have been finalised.

To date, Topcon has been the only popular brand to harness additional satellite signals, making use of the

Russian Glonass network. The computations are very complicated, since the Russian and American systems were never intended to be compatible. But most operators agree that Glonass improves reliability.

EC works hard at Compatibility

With Galileo, the Europeans are taking a different approach. Whilst they aim to eliminate their dependence upon the American system, they are placing a strong emphasis on compatibility. Unlike Glonass, the coordinate and time reference system used by Galileo will be harmonised with GPS.

An agreement has been signed by the US and EC for a common baseline signal structure for the open (free) services broadcast by both US and Galileo satellites, and for a process of collaboration to improve performance. There's also a US-EC pact to avoid discrimination in trade in satellite navigation goods and services.

From the European side, this has been driven by potential profits. They estimate a market for 3.5 billion GNSS chip sets by 2020 and to reap the rewards of this explosion in demand, Galileo will provide five levels of service.

Apart from the free signals, they'll be offering special positioning products aimed at such areas as law enforcement and 'safety of life', and there will naturally be a military component. A search and rescue service will be available that provides a response to the user who made the emergency call, as distinct from the current passive system.

An important distinction between Galileo and GPS is that the Europeans will be offering integrity, if your application has a need for it and you choose to enter into a commercial arrangement. This contrasts markedly with GPS, whose free-to-air signals are available on the basis of 'here they are if you want to use them, but we accept no responsibility for accuracy or continuing availability.'

The first two Galileo test satellites will be launched in 2005, and the full constellation should be in place by 2008.

Considerable Benefits for Civil Construction

The deployment of Galileo will have a profound effect on civil construction applications. To the American constellation—nominally twenty-four satellites but often twenty-seven depending upon maintenance and replacements—will be added a further thirty European satellites orbiting the planet at an altitude of 23,000km.

At any given time of the day, the new-generation GNSS receivers will have a greater number of signals to choose from and a better spread around the horizon. At the very least this means longer periods of high accuracy, and it will certainly reduce problems currently being experienced when signals are 'shadowed' by buildings and trees.

Australia is playing a Significant Role in Galileo

Australia's geographic location on the planet puts us in a position to contribute strongly to the development of Galileo, and work has been proceeding for several years.

Professor Werner Enderle moved to this country from the German Space



Atop one of the buildings of the Queensland University of Technology in Brisbane, an array of antennas awaits the first signals from Europe's second-generation Galileo satellites.

Agency to augment a team of GNSS experts assembled by Professor Miles Moody at the Queensland University of Technology. As a representative of Germany, Werner had played a significant role in the inter-European negotiations that got Galileo off the ground (so to speak).

A few months ago, atop a building in the heart of Brisbane, QUT commissioned its own ground station.

"It will shortly begin its contribution to Phase One of the Galileo system test bed validation," said Werner, and we nodded knowingly as if we understood what he meant.

One thing we can say—at QUT there are rooms full of learned-looking people and very complicated electronic equipment with constantly flashing lights, all dedicated to the intricacies of GNSS. It is all very impressive.

With Leica Geosystems, Trimble and APS all headquartered in Brisbane, QUT adds a strong academic dimension to the cutting-edge expertise concentrated in south-east Queensland.

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