GIM INTERVIEWS OWEN M. GOODMAN, CHIEF OPERATING OFFICER, FUGRO N.V.

Galileo: Commercial Hopes Unrealistic

It is likely to be 2012 before the Galileo system itself is fully operational on a stand-alone basis, says this monthâ€™s interviewee Owen Goodman, and Galileo will never be a commercially viable service as long as GPS and Glonass are free. Given current plans, Galileo is heading inevitably towards a funding crisis. National security and defence agencies could make a substantial financial contribution, but this at the expense of Galileoâ€™s status as a civilian system. The EU should leave the fulfilment of specialist civilian needs to commercial GNSS augmentation service providers and the makers of â€˜RTK-typeâ€™ GNSS equipment, so that only the user and not the general taxpayer pays for improved performance.

How did Fugro get involved in satellite positioning?

In the mid-1980s a company based in Lafayette Louisiana and called John E. Chance & Associates (JECA) introduced the worldâ€™s first â€˜24x7â€™ satellite positioning system. The system called â€˜Starfixâ€™ made use of four geostationary C-band satellites and custom-built mobile equipment to establish in real time the accurate position of vessels working in the Gulf of Mexico. In the early 1990s Fugro acquired JECA, followed by a number of other international survey/positioning companies, most by that time active in the field of Differential GPS (DGPS) positioning. By the mid-1990s Fugro had established a global DGPS service capability under the brand-name Starfix in support of its worldwide marine survey and geotechnical operations. More recently, Fugro N.V. acquired Thales Geosolutions (formally Racal Survey), including the Skyfix global DGPS service.

What services are you providing today?

Today Fugro maintains a profitable GNSS-augmentation ser-vices business providing a range of GPS and/or GLONASS augmentation services to customers worldwide. In addition to offshore survey applications, Fugro has more than 10,000 OmniSTAR customers for land-based applications such as precision farming. Through advanced augmentation services such as OmniSTAR-HP and OmniSTAR-XP Fugro offers position accuracies of better than 10cms (2 sigma) and is one of a few companies offering commercial GNSS-augmentation services globally. Many core services rely on an accurate knowledge of the geographical location of data-acquisition equipment in real time. Consequently we are able to â€˜bundleâ€™ positioning services with a range of other in-house services such as survey, geotechnical and geophysical services, which are offered to customers worldwide. Fugro operates a global GNSS-augmentation infrastructure that is second to none. Despite competition from government-funded â€˜free-to-airâ€™ DGPS services, we maintain a profitable GNSS-augmentation services business through single-minded focus on high performance (accuracy, reliability, availability, coverage) and customer service. When the planned Galileo system becomes operational Fugro intends to enhance its positioning services by augmenting the Galileo open-access service, in addition to GPS and Glonass.

Galileo is scheduled to become operational in 2008. Given our situation now, at the start of 2006, do you judge this projected date to be realistic? Please elaborate.

The successful launch of the Giove-A satellite in late December 2005 was the first truly tan-gible evidence that Galileo is becoming a reality. However, the first four Galileo validation satellites are unlikely to be launched before 2008, and possibly not until 2009. Four satellites do not make an operational system, although I expect that it should be possible to use these Galileo satellites in conjunction with the operational GPS and Glonass satellites at that time. Certainly we plan to be ready to generate augmentation data for the first Galileo satellites as soon as they are available. However, it is likely to be 2012 before the Galileo system itself is fully operational on a stand-alone basis.

How do the products and services of Fugro differ from those offered by other parties supplying satellite-positioning solutions?

As previously mentioned, Fugro seeks to differentiate its GNSS-augmentation services from other service providers through enhanced system performance and customer support. It helps that we have been operating GNSS-augmentation services on a continual basis for longer than anyone else has. It also helps that we have a significant internal market and a decentralised company culture which promotes technical innovation and entrepreneurship. Over recent years there has emerged competition for our original DGPS service from various government-funded DGPS services such as the IALA beacon service, WAAS and, more recently, EGNOS. While these augmentation systems have been extraordinarily expensive to establish and maintain, they are effectively free to the user. Given that these systems are simply replicating commercial augmentation systems the rationale for government involvement in funding these systems has always

eluded me.

How do you as a commercial company cope with such competition from free services?

Competition from free DGPS services has propelled Fugro to become even more innovative and focused on customer support: whom do you call when an IALA beacon is taken off the air for maintenance? Our OmniSTAR-HP, Starfix-XP and other services offer significantly better accuracy and coverage than WAAS and EGNOS, and we have no intention of resting on our laurels. With the coming availability of additional civilian signals on GPS, planned improvements to the Glonass constellation and, eventually, the Galileo open-access service, I fully expect our GNSS-augmentation services to continue to advance until we deliver reliable centimetre-level accuracy on a global basis. Our GNSS development personnel continually strive to enhance the performance of our augmentation solutions through improved infrastructure and algorithms. Our GNSS-augmentation software is then incorporated as â€˜firmwareâ€™ into third-party GNSS receivers that make use of the augmentation data we broadcast globally using communication satellites to improve receiver performance in real time.

You are talking firmware. Does that mean that FUGRO is getting involved in developing GNSS receivers?

Fugro is a high-tech services company, but developing GNSS receivers is not one of our activities. Today Real-time Kinematic (RTK) GNSS receivers can deliver centimetre-level position accuracies in real time over relatively short baselines (tens of kilometres). This is essentially a GNSS product (hardware) market and not one where Fugro is active. Indeed, our approach has been to co-operate with GNSS equipment manufacturers to ensure that their products are compatible with the GNSS-augmentation signals we broadcast on a global basis. Depending on their application and operating environment, users can choose between short-baseline RTK and a global OmniSTAR-HP/XP subscription service using the same hardware platform.

How do you see the future of GNSS in relation to the rapid developments going on in the GIS domain?

Thanks to technical advances over the past 25 years we live in a world where people have a growing awareness of the na-ture and applications of geospatial data. Collecting geospatial data and relating geospatial data systems back to the real world depends on accurate knowledge of geographical position in real time. For this reason GNSS is one of the enabling technologies driving the rapid advances in the GIS domain. While improvements in GPS and Glonass and the launch of Galileo will increase significantly the number of GNSS satellites avail-able, improving accuracy and signal availability particularly in urban areas, I also expect to see developments in complementary non-GNSS positioning technology in years to come. In particular, I believe that Inertial Navigation System (INS) technology will continue to advance in terms of its price/performance ratio, size and portability. The convergence of GIS with GNSS/INS and mobile communications and integration into portable computers/graphic visualisation systems will increase the utility of GIS in peopleâ€™s everyday lives to an extent few can imagine today.

There are manufacturers active in the surveying business who have already built into their present GPS receivers the ability to receive future Galileo signals. Is this not a somewhat premature move?

The answer depends on which market the GNSS product is intended to address and the expected lifetime of the product. Given that the Galileo and GPS-3 signals have been defined in terms of frequency, modulation etc., if a manufacturer is currently designing a next-generation, high-end GNSS receiver it may make sense to design the receiver hardware with an RF â€˜front-endâ€™ and signal processor capable of handling GPS, Glonass and Galileo. The cost of adding in this capability at the design/production stage is relatively modest, and it will certainly help to make a receiver future-proof. Once hardware is designed to receive the Galileo signals and has sufficient processing power to spare it will be relatively simple to upgrade the receiverâ€™s firmware to improve its performance by adding Galileo to the solution at a later stage. Even with the first operational Galileo satellites still a few years away, it makes sense for Fugro to consider purchasing today GNSS receivers capable of being upgraded to support Galileo for certain applications, e.g. GNSS reference stations.

Fugro currently provides certain clients with Glonass augmentation data for use in conjunction with GPS data, particularly the offshore sector. What is your opinion on the future of Glonass?

In circumstances where the GPS satellite geometry is degraded, the combination of GPS and Glonass satellites improves position accuracy and service avail-ability. It has recently been the case that GPS â€˜DOP valuesâ€™ were degraded due to the temporarily unhealthy status of two satellites. Extreme ionospheric scintillation is another factor which can lead to temporary loss of satellite signals. The impact of these problems can be reduced by today integrating GPS and Glonass measurements at receiver level. From a GNSS users perspective the more satellites the better, as long as the signals are free! If, like the US and the EU, Russia maintains the stance that it cannot afford to rely on others for its GNSS capability, then Glonass certainly has a future. In fact, if Glonass were to be fully funded by the Russian government for national stra-tegic/defence reasons it may have a more secure long-term future than Galileo. The latter must recover much of its investment and operational costs from the private sector in a market situation where most, if not all, mass-market applications will be satisfied with the free signals provided by GPS, Glonass and Galileo itself.

When Galileo does become operational, what will be its role in GNSS mass-market applications such as those used in precision agriculture and transport?

Given the number of farmers involved in precision farming it is certainly not the case that precision farming is a global mass-market application for GNSS today, and I have doubts that precision farming could ever constitute one. However, there is certainly a potential mass-market for general-purpose GNSS-based navigation products for vehicle, vessel or personal navigation. By the time Galileo is fully operational, the combination of free GNSS services (GPS, Glonass and Galileo Open Service) and low-cost INS technology and GIS systems will provide sub-meter position-ing/navigation capability free of charge. The fact that a significant market demand exists, that hardware is cheap and user fees zero is what turns general-purpose navigation into a mass-market.

Galileo will be a commercial service brought into existence through taxpayerâ€™s money. What are your feelings about bringing to birth a service in this way?

To answer this question it is necessary to make a clear distinction between a Galileo system designed to support the navigational needs of

the general public, public search-and-rescue needs and national security/defence-related needs on one hand, and a commercially-orientated Galileo system on the other. The latter does some or all of these things, but in addition seeks to address commercial needs. It would appear that the proposed Galileo Concessionaire is expected to address not only public- service GNSS needs, but also the commercial augmentation-services market. Therein lies the problem.

Could you please elaborate on that?

I believe governments should step in to provide services or infrastructure only when it is not commercially viable for the private sector to do so, or for humanitarian reasons. It is clear that so long as GPS and Glonass remain free the private sector would never step in to develop and implement a Galileo system to meet public needs. Consequently, if the EU truly believes it strategically/ economically important to eliminate our dependency on the USA or Russia for GNSS capability, then it is necessary for the EU (i.e. the taxpayer) to fund a Galileo system that meets these needs.
However, there is absolutely no need for the EU taxpayer to fund Galileo augmentation elements (whether space or ground segment) which are intended to support specialised augmentation services for commercial applications or the administration of commercial services. Once there is a basic (public) Galileo system in place, it is quite clear that the private sector is both willing and able to fund and operate Galileo-augmentation systems to meet specialised commercial needs such as precision farming or surveyâ€¦

...The Galileo system has anyhow to be funded either by commercial activities or by taxpayerâ€™s money or by both...

â€¦I firmly believe that Galileo will never be a commercially viable service as long as GPS and Glonass are free, and therefore in my view Galileo is heading inevitably towards a funding crisis. This is because expected Galileo revenue streams from the private sector will be wholly inadequate to cover the implementation costs of Galileo, let alone the ongoing support costs. We need to keep in mind that GPS and Glonass are not standing still; they will continue to develop and improve in performance. It is unrealistic to imagine that the Galileo operator can charge a fee for a level of service freely available from GPS and Glonass. And, when you combine the free signals from GPS-3, Glonass and Galileo, the integrated solution is likely to provide a sub-meter accuracy service that meets the needs of the vast majority of users in terms of accuracy, availability, reliability and integrity! The specialist high-accuracy market will choose between â€˜RTK typeâ€™ GNSS products and fee-based augmentation services (as they do today), but this user group is really not big enough to contribute any substantial part of Galileoâ€™s multi-billion euro cost...

...Security and defence departments could cover a significant part of the costs of Galileo...

...Of course, national security and defence agencies could make a substantial contribution, although this would seriously undermine the much-hyped portrayal of Galileo as a civilian GNSS system. In todayâ€™s security-preoccupied world, how realistic is it anyway to believe that Galileo could operate as a â€˜neutralâ€™ civilian system, free from military interference? I think it is about time the European Commission was more open with the public regarding the Commissionâ€™s strategic/geo-political and national security angle on Galileo, and more realistic about the likely level of funding for Galileo which can be expected from the private sector. The unfortunate problem faced by the Galileo project is that of unrealistic expectations concerning the commercial viab-ility of the undertaking, created at the outset in an effort to win political support for the system amongst EU Member States. The instigators of Galileo have overlooked a number of facts. That todayâ€™s GNSS augmentation service providers and equipment manufacturers do not contribute directly towards the cost of GPS or Glonass and there is no good reason why they should be expected to contribute voluntarily towards Galileo. That even without augmentation a GNSS receiver which combines GPS, Glonass and Galileo (open access service) is likely to deliver a level of performance meeting the needs of the vast majority of users, i.e. the mass market. That future Galileo revenue streams from the private sector will therefore be wholly inadequate to cover the implementation costs of Galileo, let alone the costs involved in ongoing support. And, finally, that if the Galileo Concessionaire intends to compete in a truly free GNSS-augmentation-services market, this may compromise the Concessionaireâ€™s eligibility for future government funding necessary to maintain the system.

So even before birth, the life of Galileo is already endangered?

To guarantee the future of Galileo the EU and its allies should be prepared to fully fund a Galileo system that meets strategic, national security, search-and-rescue and basic civilian navigation needs. Furthermore, in order to reduce system costs and avoid falling foul of its own competition rules the EU should leave the fulfilment of specialist civilian needs such as survey and precision farming to commercial GNSS-augmentation service providers and the makers of â€˜RTK-typeâ€™ GNSS equipment. So that only those requiring such services, and not the general taxpayer, pay for the improved performance.
