

Coordinates

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**It is a time to talk about Asian satellite navigation system
– Gyu-In Jee**

GNSS technology has evolved as a necessary utility – Michael Lindsay

Compared with Europe and USA, we still see a pioneering spirit in Asia – Flemming Lindholm

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“GNSS technology has evolved as a necessary utility”

Says Michael Lindsay, Chief Operating Officer, NavCom Technology while sharing his observations on NavCom’ vision, expertise and trends in technological innovations

What is so unique about NAVCOM? Tell us about NavCom.

NavCom is the only company in the high precision GNSS products business that owns the core intellectual property behind both GNSS receivers and a Global Satellite Based Augmentation Service (GSBAS). NavCom’s ability to tightly couple the design of its GNSS receivers and its StarFire™ GSBAS service allows us to provide innovative solutions to the marketplace that enhance the quality and competitiveness of our customers’ solutions. One example of this is our RTK Extend™ feature that is unique in the market. By alleviating the constraints of local radio propagation concerns, RTK Extend allows Surveyors, for example, to complete their missions without interruption despite potentially inconsistent radio coverage, thus increasing productivity in the field.

Tell us about the vision and expertise of NavCom

NavCom provides an extensive range of GNSS receivers as well as our StarFire GSBAS service to the high precision positioning and navigation markets. Our close relationship with our parent company, John Deere, has translated into substantial growth and innovation within the Precision Agricultural marketplace by providing a number of advanced products and services that have revolutionized farming practices and substantially enhanced farm productivity. Our vision is to replicate this successful formula in other market sectors such as Construction, Land Survey, Offshore Exploration and others by

partnering with John Deere and other companies that have the same goals and aspirations as ourselves in delivering customer solutions which provide a sustainable competitive advantage.

What key products and services do you offer?

NavCom offers an extensive range of high precision GNSS receivers as well as the StarFire™ Network, the world’s first SBAS providing base station-free decimeter accuracy across the globe. Along with being a highly cost-effective solution, the system enables a broad range of user benefits and flexibility options from one centimeter to decimeter real-time positioning up to millimeter positioning with post processing. In addition, NavCom provides consulting services in the fields of precise positioning, wireless communication and robotics.

What market trends do you see in the field of precision GPS and wireless communication?

GNSS technology has evolved as a necessary utility in today’s world as a result of the fundamental productivity improvements that it enables, therefore, its adoption is accelerating dramatically. Although this is most evident in the lower precision market segments such as car navigation and outdoor recreational activities, the adoption rate in high precision applications is also accelerating. GPS is routinely used in land, sea and aerial survey applications, and it is also very common to see it used in GIS/ mapping applications as municipalities are committed to building ever

more accurate geo-spatial databases of their assets. Finally in the area of machine control, whether fully autonomous or guidance assisted, GPS is making dramatic changes to the way that routine work is performed.

The field of wireless communications is undergoing equally dramatic changes with the advent of many new and feature rich services that are enabling advanced connectivity and communication on an unprecedented scale. In fact by deploying wireless technologies, countries such as India are bypassing many earlier generations of communications technology and rapidly deploying a more updated communications infrastructure, resulting in significant quality of life changes for their populations with a corresponding beneficial effect on their economies.

Which direction is the technology heading in terms of innovations and applications?

It is probably not too trite to say...smaller, cheaper, faster and more features. With all electronics technologies there is an endless challenge to do more with less, and GNSS is no exception. So I see continued technical innovation aimed at improving the performance of GNSS in signal acquisition, signal tracking, multi-path mitigation and interference rejection while at the same time reducing size, power consumption and cost and adding support for more GNSS constellations (Galileo, Glonass, IRNSS etc.)

In the applications space, the fairly recent adoption of GNSS technology



Michael Lindsay is the Chief Operating Officer of NavCom Technology, Inc., a John Deere Company, where he has responsibility for developing NavCom's precise positioning and navigation business worldwide. Prior to joining NavCom, he worked in the terrestrial and satellite based telecommunications industry for a number of companies including STM Wireless, Dowty Communications and Case Communications. Born and educated in the United Kingdom, Michael holds

a BA (Hons.) degree in Economics and Financial Control from the University of Lancaster in the United Kingdom and is an Associate member of the Institute of Chartered Accountants in England and Wales. Michael has worked as a senior executive in a number of roles for public, private and venture backed start up companies in both the UK and USA and he has extensive experience in building, developing and marketing businesses both domestically and internationally.

in Agriculture has proved a major factor in enhancing farm economic performance. I see this continuing to grow rapidly, and as the productivity benefits are widely publicized, the adoption of this technology in other market segments will also accelerate. In the USA we are already seeing extensive and rapid deployment of GNSS technology in the Construction industry with systems that provide automation of earth moving equipment. Although most of today's uses of GNSS technology for robotic applications are within the military sector, we see significant opportunity for such technologies in commercial non-military environments whereby GNSS receivers will be a large part of the localization and navigation solution for non-military robotic vehicles.

How do you see the market in the developing world in general or in India in particular?

As I noted earlier, the market for high precision GNSS technology is growing rapidly and we expect that to continue for a while. On a global basis, we are still at the early part of the adoption curve for this technology and there are many exciting applications that remain unexplored. As the performance of GNSS receivers increases, as we add more GNSS constellations and as the cost of GNSS receivers comes down, I expect the high precision market to grow dramatically. In India, while the use of GNSS technology is still at an early stage, the implementation of the GAGAN-TDS augmentation

system and success of its preliminary tests confirm the commitment and acceptance of the technology and point to much more growth to come and many applications to explore. We are excited by the prospects for the Indian market and glad to be able to participate through both collaborative and newly defined opportunities.

Is there any basic difference in approach and response in between the developing world and the developed world?

It is really a question of application maturity. In the developed world, there is more infrastructure in place and as a result, the usefulness of GNSS technology is amplified by the more immediate effect it has on multiple areas of life. In the developing world, GNSS technology is primarily used to build infrastructure that is needed and as such the amplification factors will come at a later stage. However, as with wireless communications, the developing economies have the opportunity to bypass some of the interim systems and technologies already adopted and later discarded by the developed world. By doing this, the developing world will leap straight to state-of-the-art systems.

Many feel that India is a price sensitive market and that at times it is difficult to make inroads in such a market. Any comments?

All markets are price sensitive markets.

We live in a global economy and all products and services whether technology based or otherwise, have to prove their worth to the consumer. For us, it is a simple equation. We must demonstrate to our customers that their investment in our products and services will be paid back at a high rate of return. If we do this, we will succeed in the market. If not, we will fail. This same basic rule applies to all the markets we play in. The only differences come in the nuances added by local conditions. Thus in India, for instance, where labor costs are lower than in say the USA, it may take a little longer for labor-intensive applications to adopt GNSS technologies if the only perceived benefit these technologies provide are lower labor costs. However, where the deployment of GNSS is a core enabler of applications that would otherwise be very difficult or impossible without GNSS, then the adoption rate in India is likely to be similar to the rest of the world.

How do you see the emergence of alternative space based positioning systems like Galileo?

Galileo, IRNSS and other similar systems are welcome additions to the GNSS sector. By adding robustness and density of coverage to the constellations available for use in positioning and navigation, these added systems make all of our lives better and provide stronger assurances that the tools we have grown to rely on as part of everyday life, will be there when we need them.