Date

Thursday 19 July 2007

Title of session

Workshop 2 - Spatial – The Final Frontier?

Name of presenter/chair

Chair: Neil Ackroyd, Director of Data Collection and Management, Ordnance Survey

Presenter: Prof Terry Moore, Institute of Engineering Surveying & Space Geodesy, University of Nottingham, UK

Rapporteurs

Colin Henderson, Ordnance Survey and Selena Patton, Defence Geographic Centre

Presentation title: A review of Satellite Navigation Systems and Future Developments

This presentation began with a brief description of how Satellite Navigation Systems work. All satellites in the constellation are one-way ranging systems; the ground device is a passive receiver of the signal from satellites. The American GPS system has 31 satellites in orbit, 30 of which are operational. The ground system can cope with more space-craft but there is currently no budget to launch them.

During the 1980's there were six to seven satellite launches a year; the satellites are all ageing and will eventually go beyond their design life. Currently this is coped with by having an extra satellite in redundancy. The positions of these satellites can be moved to a new position if required.

Modernisation of the system brought about a code for use by civilian applications and a new code added for military use. Block IIF has no military signal in the radio spectrum; it has three signals so acquisition is quicker. Block III signals will be compatible with the European Galileo system. The schedule for this modernisation is to have 24 satellites by 2015.

The Russian GLONASS constellation has 11 operational spacecraft. Each satellite in the constellation transmits a signal on a different frequency. There has been a decree that there will be 18 satellites by the end of 2007. This will be achieved by launching three satellites at the same time.

Unlike the American and Russian systems, the European Galileo system is a civilian led programme with the aim to launch a total of 30 satellites. The system will work on a number of service levels according to the application; an open service, a commercial service, a search and rescue service and a public regulated service. The public regulated service would be for government use and will be encrypted. This service model approach means that service guarantees can be provided at different levels. This could be important, particularly for the commercial service where operators will expect a high quality and safe signal. The first Galileo satellite is operational and broadcasting a test signal. Currently the Galileo system is hampered by funding issues. An appropriate public/private finance deal can not be agreed upon and there is concern that the system will not generate enough revenue to operate. A new financial model is expected in September this year.

China is also launching a new system called COMPASS; this launch is expected in the next couple of years.

Questions	Answers
Is Galileo encrypted and is it on an area basis?	The signal is encrypted depending on the service level, encryption is global - there is no area based encryption. The open service is not encrypted as you would expect. The safety of life service is encrypted and can only be accessed by appropriate organisations. The commercial service is encrypted on a pay per use principle. Galileo has not been designed for military use, however it would be foolish to launch a system and not have the ability to encrypt its signal in times of war. This encryption was a key discussion point with the Americans when discussing interoperability between the two systems.
Paul Hardy, (ESRI): There is speculation in the British press that the days of GNSS may be numbered because government would use them for unpopular schemes, such as road user charging. People are likely to jam or spoof the signal which will result in a weak signal and subsequent poor positioning. Will this be a problem?	People may choose to block the signal either by spoofing or jamming the signal. The key to preventing this will be the way in which these government policies are 'sold' to the public. For these government policy areas the public regulated service could be used which has a level of encryption that will make it hard to jam or spoof the signal. The biggest concern will be signal spoofing, especially to those who use the safety of life service.
Sook Yee Loh (Singapore): When do we need to buy equipment that is compatible with the new signals?	Receivers that are compatible with the new signals can be bought now. The key would be to buy with flexibility in mind; more flexibility will give you more options when the signals are switched on. 2012 will be a significant date and it may well be worth waiting

	until then before purchasing new equipment for the new signals.
How can we achieve decimetre positioning?	By improved orbits, use of multiple frequencies and improved atomic clocks. It is realistic to expect at some point in the near future.