

CGSIC Meeting Review

>> By Glen Gibbons

Presentations at the 45th meeting of the Civil GPS Service Interface Committee (CGSIC) September 12-13, 2005 comprised a mixed bag for the surveying and mapping community. Highlights included the announcement of a new schedule for the long-delayed launch of the first modernized GPS Block II replenishment (IIR-M1) satellite (the launch took place September 25th).

The spacecraft will be the first to broadcast the new civil signal (L2C) centered at 1225 MHz, from which the encrypted military P/Y-code has long been transmitted.

L2C will enable more accurate and robust real-time kinematic techniques used in surveying, construction, automated machine control, and a proliferating array of other high-precision applications. Rather than having to use codeless double-differencing techniques to recover the L2 carrier phase, receiver manufacturers and users will have full access to the observables from an improved signal design.

However, comments by European representatives reaffirmed that the Galileo system now under development will not transmit a signal at L2, as numerous experts in the U.S. Positioning, Navigation & Timing (PNT) community had hoped. The Galileo system currently being implemented by the European Space Agency and the European Union (EU) will launch its first satellite on December 16. When Galileo reaches full operational capability, now projected for early 2011, inclusion of an L2C signal would have meant a doubling of satellites broadcasting dual-frequency signals at the two bands used by the surveying community. Galileo will broadcast a signal (E5a) that overlaps the

new GPS civil L5 signal built into the Block IIF (follow-on) satellites, which are scheduled to begin launching in 2008.

Some encouragement may be found in the announcement by a Russian official that the GLONASS system has had two modernized spacecraft (GLONASS-M) broadcasting an open signal at L2 since December 2003. The Russian GLONASS system briefly achieved a full constellation of satellites in 1996 before dwindling to seven spacecraft four years ago, but has now grown to 13 operational spacecraft with launch of another two GLONASS-M satellites set for December 25, 2005.

Sergey Revnivkykh, who works with the Satellite Navigation Control Center's Space Mission Center of the Central Research Institute of Machine Building, told the CGSIC audience that the Russian Space Agency's plan for GLONASS would mean 18 satellites would be on orbit by the end of 2007 and 21 satellites in the 2010-11 time frame.

Although GLONASS employs a frequency-division scheme rather than GPS's code-division approach, combined GPS/GLONASS receivers were introduced by Ashtech, Inc., in the early 1990s and are now offered by several companies. A new 72-channel receiver chip—the Paradigm-G3™, developed by Topcon Positioning—is capable of receiving GPS L1, L2 and L5 carrier frequencies; C/A and L2C civilian codes; and P-code on both L1 and L2 frequencies. It also receives GLONASS signals including L1 and L2 carrier frequencies and L1 / L2 C/A and P-codes. The entire

Galileo signal structure is supported, including L1, E1, E2, E5, and E6 signals. Additionally, Javad Navigation Systems has a license to Topcon's new chip—calling it the GeNiuSS—that is limited to use in commercial markets outside of the precision markets serviced by Topcon.

In another area of interest for survey, mapping, and geographic information system (GIS) applications, the Nationwide Differential GPS (NDGPS) network of radiobeacon-based correction broadcast sites could get a boost in the federal 2006 fiscal year (FY06) budget. By using NDGPS code-based corrections, users can obtain real-time positioning accurate to about 1-3 meters. A high-accuracy service that could provide 10-15 centimeter accuracy is also under consideration.

The NDGPS system, built largely around U.S. Coast Guard radiobeacon transmitters and converted U.S. Air Force Ground Wave Emergency Network (GWEN) stations, has slowly but steadily expanded its coverage over the last 10 years with allocations that have never reached more than \$6 million per year. Nonetheless, NDGPS coverage in the continental United States has reached 92 percent, according to Mike Shaw, director of the U.S. Department of Transportation (USDOT) Office of Navigation and Spectrum Policy.

For FY06, however, the Office of Management and Budget (OMB) recommended a \$20 million allocation. In its version of the budget the U.S. House of Representatives eliminated the NDGPS funding, but the Senate approved \$15

million for the system, according to Len Allen, program manager for the Federal Railroad Administration's intelligent railroad systems, which is using NDGPS in several demonstration projects. A House-Senate conference committee will reconcile the two different takes on the NDGPS funding in the coming weeks.

Speakers in the CGSIC's U.S. States and Localities Subcommittee illustrated the benefit for employing NDGPS in northern latitudes and rugged terrain in which it is difficult to employ other real-time GPS differential systems such as the Federal Aviation Administration's Wide Area Augmentation System (WAAS). Karl Brown, vegetation and mapping program manager for the Department of the Interior, noted that in one recent field campaign a handheld Garmin receiver operating in autonomous (uncorrected) mode produced higher-accuracy positions (11 meters horizontal) than a WAAS-capable receiver (19 meters).

Brown attributed those results to the fact that the WAAS geostationary satellite which appeared low on the horizon only provided corrections for GPS satellites visible to it, while the Garmin receiver achieved a better

geometrical solution (position dilution of precision or PDOP, an error factor that multiplies other error sources in a GPS position fix) from a more dispersed set of satellites. "NDGPS rocks!" said Brown. "It's the thing that's going to get the job done in rugged terrain."

Gavin Schrock, a GIS analyst and surveyor for the Seattle Public Utilities Department, described a series of real-time kinematic GPS initiatives under way in Washington state and the Pacific Northwest. A 33-station Puget Sound Reference Network ties into other networks with the support of the Washington Department of Transportation. Cooperative members, or those that contribute infrastructure or direct funding receive open access to the system. All others, in both public and private sectors, can use the system for a nominal fee charged to offset the costs of providing open access. This is currently \$1800 per year, but which is expected to be reduced each year and eventually become a free service. The Pierce County continuously operating reference system (CORS) network, an affiliate initiative has a different funding model; in an arrangement with the control

densification program of the public works department offers free service within region of their five-station network.

Also at CGSIC meeting, the National Geodetic Survey (NGS) sponsored a users' forum for participation in the national and cooperative CORS networks (see Gavin Schrock's CORS article in this issue).

The 19-year-old CGSIC serves as a forum for information exchange for government agencies, private companies, and non-governmental organizations involved with space-based positioning, navigation, and timing (PNT). The group is co-chaired by the U.S. Department of Transportation Office for Spectrum and Radionavigation Policy and the U.S. Coast Guard Navigation Center. *A*

Glen Gibbons is managing director of *Inside GNSS*, a forthcoming business publication covering the policies, programs, design & integration, and most challenging applications of GPS, Galileo, GLONASS and other global navigation satellite systems (GNSS). A resident of Eugene, Oregon, he is the founding editor of *GPS World* and *Galileo's World* magazines.



That's ours too.

Photo Courtesy of Palm Desert Civic Center Park

Berntsen has over thirty years of experience in helping surveyors and developers mark their creations. Surveyors know that they're working with the most technologically advanced monument and marker manufacturer in the world. And they know that Berntsen means quality survey products, faster and easier ordering, customized product solutions and a more complete product line than anyone else in the industry.

Civic Center Park in Palm Desert is just one of many development projects that has the Berntsen mark of quality. Shouldn't yours?

Berntsen
Making our mark on the world.
877.868.8565 www.berntsen.com