



## Editorial

>> Marc Cheves, LS

# THE American Surveyor

A FOOT IN THE PAST... AN EYE TO THE FUTURE

[www.amerisurv.com](http://www.amerisurv.com)

Volume 4, No. 10 December 2007  
© Cheves Media LLC

**PUBLISHER** Allen E. Cheves  
[allen.cheves@chevesmedia.com](mailto:allen.cheves@chevesmedia.com)

**EDITOR** Marc S. Cheves, LS  
[marc.cheves@chevesmedia.com](mailto:marc.cheves@chevesmedia.com)

**ASSOCIATE EDITOR** Joel Leininger, LS  
**ASSISTANT EDITOR** Jacalyn Cheves

### CONTRIBUTING WRITERS

Silvio A. Bedini	Thomas Liuzzo, LS
Dale Beeks	Jeff Lock
Joseph Bell, LS	Dan Martin
Joe Betit, LS	John Matonich, LS
Shawn Billings, LS	Thomas G. Merrill, LS
J. Anthony Cavell, LS	Jerry Penry, LS
Cathy B. Costarides, LS	Al Pepling, LS
Paul Cuomo, LS	Mark X. Plog, LS
James J. Demma, Esq., LS	Walt Robillard, Esq., LS
Dr. Richard L. Elgin, LS, PE	Fred Roeder, LS
Fred Henstridge, LS	Gavin Schrock, LS
Chuck Karayan, LS	Angus W. Stocking, LS
Gary Kent, LS	Patrick Toscano, LS
Wendy Lathrop, LS	Rj Zimmer, LS

The staff and contributing writers may be reached via the online Message Center at [www.amerisurv.com](http://www.amerisurv.com)

**GRAPHIC DESIGN** LTD Creative, LLC  
**WEBMASTER** Joel Cheves  
**ACCOUNT EXECUTIVE** Richard Bremer  
[rich.bremer@chevesmedia.com](mailto:rich.bremer@chevesmedia.com)

*The American Surveyor* (ISSN 1548-2669) is published January/February, March, April, May, June, July/August, September, October, November and December by Cheves Media LLC. Editorial mailing address: 905 W. 7th St., #331, Frederick, MD 21701. Tel: (301) 620-0784.

*The American Surveyor* is a publication of Cheves Media LLC, 905 W. 7th St., #331, Frederick, MD. No part of this publication may be reproduced in any form without the express written permission of the publisher. Opinions and statements made by the writers and contributors do not necessarily express the views of Cheves Media LLC.

Subscriptions prices in the U.S.: Free for qualified professionals. Canada: 1 year \$56.00 US; international subscriptions \$72.00 per year (Airmail), U.S. funds prepaid. Back issues (subject to sufficient stock) are available for \$4.95 + S/H.

New subscription inquiries and all other address changes should be sent to *The American Surveyor*, P.O. Box 4162, Frederick, MD 21705-4162. Fax: 301-695-1538. Subscribe online @ [www.amerisurv.com](http://www.amerisurv.com)

Made in the United States of America



Proud Member of:



## CGSIC

**T**hings are rocking right along in the GNSS world, and the Civil GPS Service Interface Committee meeting is where it all comes together. It is predicted that, by 2020, six or more systems will be operating. In addition to planned or existing constellations from the United States, Russia, Europe and China, both Japan and India are well along with WAAS-like augmentation systems. The net result of the four planned constellations is that we will have 120+ satellites to work with. More signals, and stronger signals from an abundance of satellites will be a boon to the precise community.

What is the likelihood this will happen? Both Japan and China have launched lunar orbiting missions to explore the moon. India will also soon launch a lunar mission. In addition to spectrometry, the Chinese orbiter will employ stereo photography and a laser altimeter to map the surface and to look for minerals.

Of course, for the precise community to reap the benefits of so many satellites, there will have to be cooperation between the various systems. **Alice Wong** from the U.S. State Department gave a good definition of cooperation: Compatible is when the systems can co-exist, that is, the signal frequencies used do not conflict. Interoperable means that the signals work together, for example, equipment can be designed to take advantage of this interoperability.

**Capt. Matt Blizard** from the Department of Homeland Security gave a report on interference, detection and mitigation. All three user groups—military, surface and aviation—have their own outage reporting procedures. Unfortunately, with the explosion of car-nav units, 90-95 percent of outage complaints are user-equipment related, and being generated by people who call when a street is not in their car unit.

I recently had a weird thing happen to me with my car units. On my recent road trip, just as I was about to exit the beltway in Memphis, the car unit stopped working. Magellan was kind enough to give me a handheld unit, so I quickly turned it on, thinking that the built-in car unit was on the fritz. Not so. The outage on both units lasted for more than an hour. As surveyors, we've dealt with "local attraction" on compass needles, and this appeared to me to be a wide-area interference problem. Blizard told about an incident in San Diego where an experiment by Navy users accidentally blocked the L1 signal for a ten-mile radius. The medical paging system was knocked out, and general aviation noticed it, but the source was quickly located and turned off. And even though today's weak signals will be strengthened with the next-gen satellites, meaning that GNSS will work better and in more places, this year's ION President, **John Lavrakas**, reminded the audience that GPS jammers can be purchased on eBay.

As predicted, the Architecture Evolution Plan I wrote about in last month's editorial went off without a hitch. For a 14-hour period beginning on September 13, the long-planned and much-rehearsed transition was made, bringing the ground control segment of our constellation out of the mainframe era. **Tom Powell** of the GPS Wing reported that four more Block II-M satellites will be launched in FY08, and that User Range Error has been driven down to  $\pm 0.88$  meters. It still amazes me that back in the day, the best we could do for the broadcast almanac—the prediction of where an individual satellite will be at any given point in time—was  $\pm 20$  meters. Now, it's less than 30 centimeters!

**Joe Kunches** from NOAA's Space Weather Prediction Center in Boulder gave a fascinating report on efforts to achieve the holy grail of space weather, ionospheric activity. Currently, space weather scientists can tell what took place in the ionosphere 15 minutes ago, but the goal is to be able to predict six hours in advance. The ionosphere imposes approximately 7 meters of positioning error, and is often the largest error source for single frequency application. Even though single frequency users are most affected, NDGPS positioning and dual-frequency integer ambiguity resolution for rapid centimeter-accuracy positioning will benefit from near-real time ionospheric models. We are entering into Solar Cycle 24, a period of increased sunspot activity which will cause the ionosphere to behave more erratically. Interestingly, sunspot number prediction gives an "envelope" of activity, similar to forecasts of the hurricane season. Predictions are not only difficult, but a wide prediction variance exists within the scientific community.

Kunches recounted the December 2006 extraordinary solar radio burst that was ten times more powerful than the previous record and which occurred during the Solar Minimum. Not to be confused with Coronal Mass Ejections caused by sunspots, which take approximately 93 hours to reach Earth, a radio burst arrives in 20 minutes to 15 hours. Observation satellites are parked between the earth and sun to detect solar activity and act as an early warning system. Because the radio waves from the burst took the same waveform as the GPS signal (right-hand circularly polarized, that is) the 2006 burst affected GPS receivers. There's a controversy as to how much the effect was, but such an event has nothing to do with the ionosphere and can affect receivers by drowning out the GPS signal.

### **States & Localities Subcommittee Meeting**

As I mentioned last month, the big buzz was the pending death of NDGPS. Previously the Federal Railway Administration had funded NDGPS for Positive Train Control. When I asked **Mike Shaw**, Director of the U.S. National Coordination Office for Space-Based Positioning, Navigation, and Timing (PNT), why the FRA had ceased funding for NDGPS, he said, "The FRA had decided that its responsibility was

to establish policy, not implementations. The implementations are up to the railroads." In other words, the railroads have to decide what they need and then pay for it.

Another downside to the death of NDGPS is that 30-35 CORS stations will disappear. The Coast Guard has said that it will pick up 10-12 NDGPS stations to maintain its maritime navigation mission. OPUS, which is being used by more than 29,000 users, and which processes 25,000 sessions per month, uses many of the NDGPS stations.

Several passionate presentations were made as to why we need NDGPS. My own state of Maryland is making extensive use of NDGPS after finding that handheld units such as Garmins couldn't deliver the needed accuracy. The Maryland departments of environment, transportation and natural resources are using NDGPS for a wide range of activities. **Joseph White** from the Maryland State Highway Administration outlined uses for road inventory, road centerline, sidewalks for ADA compliance and general asset management. MDSHA is seeing dramatic improvements in the time necessary to accomplish these tasks as well as a reduction in the number of personnel needed. The MDDOE is doing digital flood plain mapping with NDGPS. And it's even being used by the Maryland Natural Resources Police for its fleet of four icebreakers on the Chesapeake Bay, tasked with breaking ice in navigation channels to ensure that oil and food reaches about 500,000 people in the lower Eastern Shore area.

Participants from Oregon and North Dakota flatly stated that WAAS provides worse accuracies than NDGPS, was designed for the aviation community and not for surface users, and in areas of no cell coverage NDGPS is the only thing that works. One presenter painted a future where not only will we be able to track ships and individual containers on ships, but even individual packages inside containers. The point was also made that NDGPS can be used to encourage the growth of new markets. I was immediately reminded of the words of engineer and futurist **Roy Amara**: "We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run."

I have mixed feelings about NDGPS. I'm a strong proponent of keeping the government out of the private sector for those things that the private sector can do

without government aid. Both Omnistar and StarFire (from John Deere's Navcom) provide augmentations for GPS that can be used for agriculture and other non-precise applications. But here's the rub: NDGPS is not much use for the precise crowd, but High Accuracy NDGPS can provide centimeter-level accuracies in static mode out to 50km from a single base station. It can also provide dynamic accuracies approaching a tenth of a meter out to 250km. HA-NDGPS depends on NDGPS. My interest in this is not for the urban areas that will eventually be covered by RTNs. It's for the rural surveyor who will never have an RTN, but still needs precise positioning.

In the interest of fairness, I contacted **John Pointon**, Director of Sales for Omnistar; here's what he had to say: *(1) WAAS has taken over as the 'free' differential service of choice among the sub-meter customer base, (2) local area 300Khz coverage, if deemed essential by specific operators, could be funded locally rather than Federally, and (3) the time-scale of any accuracy enhancements to 300Khz DGPS is likely to be such that it will significantly lag the ongoing developments in alternative wide-area solutions which are already offering accuracies of less than ±10cm nationwide.*

Some are saying that we can provide high-speed Internet access to every citizen in the country. We've seen that we can't even provide cell coverage across the entire country, so short of a massive satellite-based system, it's unlikely that rural areas will receive higher bandwidth unless new technology develops. In their current form, Omnistar and StarFire will not be able to provide centimeter-level accuracies. So what to do?

The funding for NDGPS and HA-NDGPS is minuscule compared to other government programs, and the potential benefits, many as yet unknown, are tremendous. Pointon feels that NDGPS is redundant, but agrees that Omnistar cannot provide the accuracies needed by surveyors looking for centimeter-level accuracies. And Pointon made another salient point: why is it that nobody is stepping up to pay for NDGPS? Could it be that people just want it because it's free? Which brings me back to Roy Amara's statement. Could it be that the long-term markets opened up and created by NDGPS and HA-NDGPS will far outweigh the short-term investment in tax dollars? Once the system is built out, the yearly maintenance will be a pittance. 