

a visit to Hemisphere GPS



Dr. Michael Whitehead
Chief Scientist



Steve Miller
Director of Technology



John Bohlke
Director of Product Marketing



Kirk Burnell
Technical Product Manager

In keeping with the magazine's mission of presenting new technology and introducing our readers to the people who make it happen, it was with pleasure that I recently visited Hemisphere GPS (Hemisphere) in Scottsdale, Arizona. The company is headquartered in Calgary, but most of the R&D takes place in Scottsdale. Of the company's 260 employees, 40 are located there. Formerly known as CSI Wireless, they have been in business since 1990. One of the company's early achievements in the precise arena was with Coast Guard DGPS beacons, used extensively by U.S. federal agencies such as the National Park Service for single frequency mapping.

Along the way, the company has been involved in various fixed wireless phone technologies (including TDMA, GSM and GPRS) which combine cell comms and GPS for asset tracking, trucks and containers. The telematics end was used in stolen car recovery devices. With more than 45 issued and pending technology patents and several innovation awards, the ISO-certified company has a strong presence in agriculture, marine and aerial applications, and is now parlaying its deep experience into the surveying market.

Most surveyors will be interested in Hemisphere's compact R220™ dual-frequency receiver. What attracted me to the R220 and its RTK capability is that it will work with OmniSTAR®.

>> By Marc Cheves, LS



Part of the Scottsdale antenna R&D staff.

For applications such as flood plain and wetland mapping that don't need centimeter accuracy, the R220 has real potential. It also accepts SBAS/DGPS correctors.

The Ground Agriculture business unit, based in Hiawatha, Kansas, is Hemisphere's largest segment, and provides the Outback Guidance® line for automated equipment control and sub-meter accuracy. Recently, the company announced the latest software version for its Outback S-Lite™, and said it expects to ship thousands of units into China.

The Air Products business unit, based in Scottsdale, provides specialized products for such things as crop-dusting, forestry and firefighting. The precision foundation for the company was a direct result of technology that was developed in order to eliminate the need for people with flags on the ground to direct crop-dusting planes. Also fundamental was the critical need for robustness because in sharp turns, the planes would lose lock.

The third group, Precision Products, based in Calgary, addresses needs in a wide variety of applications, including hydrographic surveying, mapping, navigation, GIS, dredging, and machine control. The 20Hz update rate of the R220 will prove useful in several of these.

As in any dynamic industry, several Hemisphere employees have spent time elsewhere. Dr. Mohamed Abousalem, VP of Marketing and Business Development, was with Thales Navigation (now Magellan) when I interviewed him in 2003. John Bohlke, Director of Product Marketing, spent six years with Sokkia and Point. Dan Cookro, Director of Business Development, who handles the OEM Survey business for the Western Hemisphere, is an ex-Air Force Captain who spent many years with Ashtech and Motorola. I might add that Dan's wife, Liz Ingwersen (also a former Ashtech employee) was our very capable administrator when I was editor of a previous magazine.

The host for my visit was John Bohlke, who graduated from the University of Minnesota in 1992 with a CE degree, followed by a physics degree from St. John's University. John spent the first part of his career with the geodetics department at MNDOT, and recalls surveying at night with the heavy receivers. He continues to be amazed at the speed with which GPS capabilities improve. In 1995 he began working for Sokkia and spent a year with Point before leaving in 2001 to begin working for Hemisphere.

Hemisphere's state-of-the-art R&D building in Scottsdale is completely wired with fiber. For security reasons, the lab computers are isolated from the rest of the computers in the building. They've been there since May 2008 and have already expanded their space. Production of the gear takes place in Calgary and Asia, and software is developed in the company's Brisbane, Australia office, making it truly a world-class operation.

According to Bohlke, Hemisphere's approach to the surveying market is open source. To that end they have



The TDS Recon XF100 uses the Hemisphere GPS Crescent board.

Juniper Archer-compatible XF101.



History of Hemisphere GPS

1990

- ▶ Canadian Systems International founded

1992

- ▶ Name changed to Communications Systems International

1993

- ▶ First DGPS radio beacon introduced

1997

- ▶ First stock issued

1999

- ▶ Satloc Inc. (an aerial and ground-based guidance system for agriculture) acquired

2000

- ▶ Name changed to CSI Wireless after acquiring Wireless Link, known for its location-based wireless data communication technology
- ▶ Satloc-developed Outback (a DGPS system for precision agriculture) introduced

2004

- ▶ 500,000th wireless device shipped

2005

- ▶ Outback business from RHS, Inc. acquired
- ▶ Proprietary ASIC chipset and Crescent receiver technology developed
- ▶ Del Norte technology acquired and combined with Satloc to form Hemisphere Air division

2006

- ▶ Telematics and fixed wireless telephone business are sold, refocusing solely on GPS

2007

- ▶ Name changed to Hemisphere GPS

2008

- ▶ Dual-frequency Eclipse technology introduced and R220 GPS receiver announced
- ▶ 100,000th Crescent receiver board shipped



One of the R&D rooms in the Scottsdale facility.

established partnerships with Carlson Software, Juniper Systems, OmniSTAR, and OnPOZ (for GPS post-processing). The company will continue to focus on sensors and will rely on dealer/distributors to assemble all the components.

I was intrigued by the anechoic chamber in which new antenna designs are tested (see image). This custom-built chamber is designed for damping extraneous radio waves. The foam material in the room is impregnated with carbon to achieve this purpose. Bohlke says receivers are reaching their limits, but that improvements in antenna technology will improve performance.

I also met with two members of the nine-person core, board-level team. Chief Scientist Dr. Michael Whitehead has been with Hemisphere since 1999 and has a long history in the industry. He's responsible for advanced GPS products, including centimeter-level products and attitude determination. His early work included stints with Satloc, IPEC/Athens and General Dynamics. While with Satloc, he worked building receivers that used the UK-based Plessey chip and included an L-band capability (L-band is what OmniSTAR uses). The Wide Area Differential GPS network that Satloc built was eventually sold to OmniSTAR.

Steve Miller is Director of Technology. Miller has been with the company since 2002 and was brought on for ASIC and signal processing expertise. Although most of today's boards are Application Specific Integrated Circuits (ASIC), Miller is hard at work on new technology

called Field Programmable Gate Array (FPGA). This software-controlled technology allows more logic on the board. Miller said the company is using FPGAs in the infancy stage of its products until the product is proven and the specifications are confirmed. Once confirmed, the product is transitioned to an ASIC-based platform to gain from improved performance characteristics, such as lower power consumption, as well as lower cost with economies of scale.

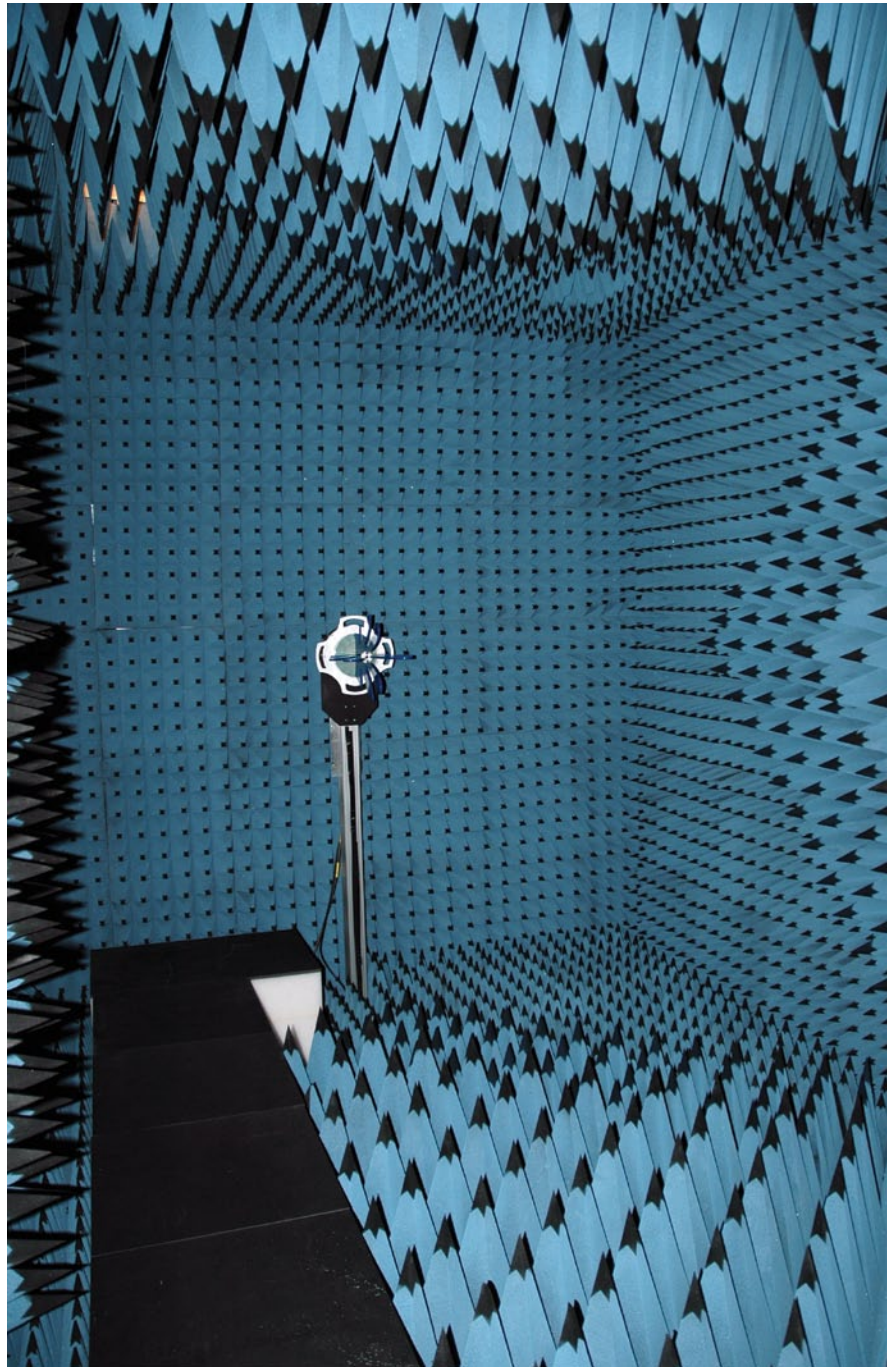


R220 dual-frequency GPS receiver.

I asked Whitehead and Miller how Hemisphere will handle the new signals that are coming. They said they are watching the launch schedules closely and will be ready when the signals are truly useable (not just being broadcast from one satellite). Both assured me that they are developing their next generation platform to accommodate modernized signals in space, and as a matter of fact, they are tracking GPS (L2C), GPS (L5) and GLONASS signals at this time. They pointed out that Hemisphere is one of two companies that are actively promoting and selling L1 RTK in a GPS product. Hemisphere's patented technology provides for efficient L1 RTK performance using WAAS signals. Both emphasized that Hemisphere is primarily in the OEM board business and that the company leads in antenna technology.

I next met with Technical Product Manager Kirk Burnell. Burnell is a PE with a 1994 degree in surveying engineering from the University of Calgary. He started with Hemisphere in 1995, spent time at NovAtel, and then returned to Hemisphere in 2006. He showed me examples of the wide range of partnering Hemisphere has set up, including compatibility with Carlson Software, VGI Solutions/OnPOZ Precision Positioning (a Canadian company that specializes in GNSS software, particularly post-processing), and HyPack (a single-frequency hydrographic application). Burnell mentioned that the R series (single-frequency R100™ and dual-frequency R220) receivers are used by all three company divisions and are core to the vertical markets, for example machine control. I learned that a Hemisphere board is inside the single-frequency Sokkia GIR1450. He showed me the TDS Recon-compatible XF100™, Juniper Archer-compatible XF101™, and TDS Nomad-compatible XF102™, all of which are smart antenna consoles that use Hemisphere's Crescent® receiver technology and interface with handheld computers, mostly for GIS applications.

Publicly-held Hemisphere (TSX:HEM) is very proud of the fact that the company is still profitable and positioned for strong growth. Last year, with revenues of \$72 million, it achieved a 35 percent growth. In 1998, revenues were \$5.6 million. Key acquisitions, such as the Australian machine control software company BEELINE at the end of 2007 have been critical to Hemisphere's



Custom-built anechoic chamber for testing antenna designs.

growth and success. Hemisphere is a leading supplier to the Chinese survey market for both L1 and L1/L2 boards. Bohlke told me that when the company changed its name to Hemisphere GPS it made a conscious decision to go with Hemisphere GPS and not Hemisphere GNSS or Hemisphere PNT, because GPS is what people think of when they consider satellite navigation and positioning. President and CEO Steven Koles

has led the organization through the implementation of an effective strategy that includes a five-year business plan and three-year product roadmap. By properly diversifying in world-wide markets, in addition to agricultural machine automation, the company has withstood the recent global downturn, and is poised to continue reaping the benefits. *AS*

Marc Cheves is Editor of the magazine.