

THE American Surveyor

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

Vol. 7, Issue 6

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Mobile Mapping

Ground cover
in Colorado

Gear Review

Hemisphere R220
and OmniSTAR

New Product

JAVAD GNSS
introduces the VS



See Our Wingfold Ad

another

He's done it again. Javad Ashjaee has released an impressive state-of-the-art product that enables surveyors to expand their GNSS capabilities. On June 29, 2010 Javad unveiled the Triumph VS at the company's 40,000 square foot newly designed headquarters and JAVAD EMS board-manufacturing facility in San Jose, California.

Over the decades, industry veterans have witnessed the progression of products upon which Javad's success is built. In the early 1980s, when he was at Trimble Navigation, Javad singlehandedly wrote all the software for the 4-channel survey-grade 4000S, a task that took him 16-hours-a-day, seven-days-a-week to accomplish. As founder and president of Ashtech (1986-1995), he introduced the first 12-channel GPS/GLONASS receiver (the L12, the M12, and finally, the legendary Z12). From 1996-2000, while president and CEO of Javad Positioning Systems, he introduced the Legacy, Odyssey and Regency receivers, followed by the 76-channel Prego and HiPer receivers. He sold the company to Topcon in 2000. Upon founding JAVAD GNSS in 2007, he soon introduced the 216-channel Triumph receiver. Javad feels that each of these ground-breaking developments spurred advancement for the GNSS industry.

The Triumph VS is actually three new products rolled into one. First is a new miniature stacked patch antenna that receives GPS, GLONASS and Galileo signals. It contains a ground plane to reduce multipath, and it also has very good phase-center stability. Second is

>> By Marc Cheves, LS

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L–R: Javad Ashjaee, founder of JAVAD GNSS; Clifton Ogden, vice president of Civic Engineering & IT; Alex Viazov, Manager, Manufacturing & Mechanical Engineering for JAVAD GNSS; and Tom Hunter, vice president of Sales for JAVAD GNSS. (Note: Ogden was the subject of the cover feature in Vol. 7, No. 5. of *The American Surveyor*)

the latest iteration of the three-processor Triumph receiver board. It has 216 channels, and is integrated with all-frequency UHF, has worldwide GSM with dual SIM card, and Ethernet, WiFi and Bluetooth. It also has more than ten hours of removable, rechargeable battery pack. The integrated UHF, GSM, WiFi and Bluetooth antennas are nicely secured inside the receiver, away from any interference or obstruction. Lastly, and most exciting, is a new controller. The three products are wrapped into a package the size and weight of a professional camera. (See sidebar for the product features.)

Now here's the backstory. In a wide-ranging interview the day after the product roll-out, we learned many things about the two-year process that led to the VS. Javad said that since his company has more than achieved its goals with

respect to hardware, much of the time was spent developing software and the user interface. Javad is 100 percent responsible for everything that comes out of the company's R&D labs in Moscow. He conceptualizes all of the hardware and software. He specifies the form factor for the housings and then uses 3D software to develop the industrial design. One of his employees said that often the day's "build" would go to Javad between 8 and 9 o'clock at night and he would spend until the wee hours testing and "trying to break it."

Javad's software development group is very responsive to customer requests, often creating a new routine in a matter of days. Case in point, the JAVAD ArcPAD Extension took only three months to develop. Because Javad himself sits next to the programmers on a daily basis,

there is no overhead for approval, no market analysis, etc. If something makes sense, it just happens. Another example of this was the primary complaint on the LinkedIn JAVAD User Group after the launch of the VS: users felt it needed a laser distance measurement capability. As with all user requests on the drawing board, it turned out Javad had already been thinking of ways an external laser could be added for those users who do a lot of laser offset work. In this case, the unit has three 5/8 x 11 connectors on the bottom, one of which can be used to screw in the laser unit, and one of the multiple ports can be used to connect it to the VS.

An example of the distillation of Javad's decades of software expertise is something as simple as the new calculator in the VS: English phrases pop up at the bottom of the screen telling you what you've

what's UNDER the HOOD

At first glance, the screen of the VH controller resembles the popular iPhone, but with 800 x 480 pixels, it has four times the resolution of the original iPhone. The ten always-present icons at the top of the screen show the status of essential items such as communication channels, satellites being tracked, current map, current settings, display and speaker and battery status, etc. You can view any satellite, along with its name, azimuth, elevation angle, health status and up to five signal strengths. The battery icon shows the history of battery performance and a prediction of battery life remaining. Also shown are inside temperature in different sections of the receiver, a great tool in varied environmental situations.

The software provides tools to perform a variety of jobs—designing shapes, surveying points, surveying boundaries, monitoring structures, stakeouts and GIS tasks. It contains 24 COGO routines. It is also loaded with many maps and over 3,000 worldwide coordinate transformations. From the menu, you can select point survey, parcel survey, trajectory survey, stop & go survey, auto stop & go survey, stakeout, stake survey, structure monitoring, fixed base station, and follow trajectory actions.

In addition to the high precision antennae on the top, there are also five quick-access, quick-program buttons (Function keys) that allow the user to



program different profiles, etc. The setting icon allows you to program the receiver for a variety of applications, stored in an unlimited number of files. You can assign five sets of settings to the five Function buttons on top of the receivers. A solid magnesium alloy case holds the receiver and other electronics; in the back there are high-capacity, rechargeable, removable battery packs, and GSM/GPRS, Bluetooth, WiFi antennae, and UHF antennae, all safely secure away from the interferences and blockages on both sides of the battery packs. Behind the removable battery pack are two removable GSM SIM cards and a removable Micro SD memory card. On top

of the battery pack there is a 3Megapixel camera to record images and videos along with the GNSS data.

Handgrips are attached to both sides of the pack. Beneath one handgrip are four protected connectors: external power, two USB ports and an Ethernet port, all LIMO-type (Odu). Beneath the other are four protected connectors for four of the following five options: external GNSS antennae, external UHF antennae, one pulse per second timing signal, event marker and external frequency output. On both sides are eyelets for shoulder strap and mounting options. On the bottom of the receiver is a high-resolution camera for continuous alignment to the mark and for recording the alignment offset along with the GNSS data, and two high quality speakers for audio signals and voice. The touchscreen display and keys can be used with fingers or stylus. You can also use the keys on the sides if you prefer. Two LEDs on the right side show the status of the battery level, and charging status. The LED on the left shows the sleep mode, which is implemented to save battery power. The microphone is on the front, to record audio files along with GNSS data. On the bottom right side, there is a headset jack. The bottom of the receiver also contains three connectors for mounting the VS on a variety of tripods, monopods, poles and machines.



another TRIUMPH!

entered. This makes using the calculator very intuitive. According to Javad, two points of view drove the software development: the effect of the user interface and ease of use. He used the iPhone as an example of a device that “just works”, and indeed, it was the iPhone design principle that was his inspiration for the VS. There is even a component of fun—the addition of a small LED light inside each hand grip is something Javad calls “mood lights” (you have to see it to believe it).

Something I found particularly interesting is the different approach used by the VS to establish the position of the unit as it makes observations. Unlike every instrument surveyors have ever used in the modern era, the central 5/8 x 11 mount for the unit is offset 2cm from the center of the unit. The center point is occupied by a downward-looking camera. Combined with the two built-in accelerometers for orientation, a digital compass for heading, and a known antenna height, the camera counts the pixels in the image of the ground and automatically corrects for the offset. For



GNSS receivers being assembled in the new JAVAD EMS facility in San Jose.

C.O.N.G.O chooses JAVAD receivers

In an article about the new L5 signal in a recent issue of *GPS World*, I noticed a previous article about the COoperative Network for GIOVE Observation (CONGO) that has been established by German Aerospace Center (DLR) and the German Federal Agency for Cartography and Geodesy (BKG) as an early test bed for experimentation with new GNSS signals. What distinguishes CONGO from other GNSS networks is its ability to track GIOVE (Galileo) signals with full global coverage and in real-time.

Because the article mentioned that nine of the eleven CONGO ground stations used JAVAD Triumph Delta-G2T or -G3TH GNSS receivers boards, I sent an inquiry to Georg Weber, a friend of mine at BKG, as to why JAVAD products had been chosen. (BKG are the folks that brought Networked Transport of RTCM via Internet Protocol—Ntrip—to the world. Ntrip allows the streaming of differential corrections over the Internet to

mobile users, and has proven very popular among the GNSS RTN user crowd.)

Georg forwarded my inquiry to Oliver Montenbrunk at DLR. Oliver explained that they “primarily chose the JAVAD Triumph receivers in late 2008 because they were the first (and at that time only) multi-frequency (L1/E1, L2, L5/E5b) and multi-constellation receivers (GPS, Galileo, GLONASS and SBAS) which offered GIOVE tracking support for general users. The Triumph technology offers a huge number of tracking channels, which puts no known restrictions on all-in-view tracking of all supported signals.”

Montenbrunk also provided many technical reasons for the selection—they are listed on the last page of the JAVAD ad in the last issue—as well as the fact that JAVAD receiver successfully mitigates the signal error from the new SVN49 GPS satellite. He added that “a Triumph receiver has also recently been proposed to fly

as part of a European experiment on the International Space Station (ISS). Besides low noise, high quality measurements, the receiver has demonstrated a superior cold start time-to-first-fix of less than a minute in signal simulator tests under the extreme dynamic conditions of an Earth-orbiting platform.” Keep in mind that the orbiting platform is moving at 17,000 miles per hour. The folks are DLR and elsewhere are also closely monitoring and evaluating the new L5 signal from the latest (SVN62) satellite. Montenbrunk concluded, “Even though a growing number of manufacturers are now offering alternative multi-constellation GNSS receivers, we believe that the Triumph receivers offer a highly competitive product at an attractive price which presently best fits the needs of our network. A highly responsive technical support and development team has furthermore contributed to continuously improve the receivers and to properly meet all user demands.”

Tom Hunter (l) and Clifton Ogden try out the new VS in front of JAVAD facility in San Jose.

those who insist on a traditional mounting, there is an adapter which has a 5/8 x 11 mount in the center.

Javad demonstrated the use of the VS for GIS by simply holding the unit at arm's length in front of his face. When questioned about the possibility of multipath interference from the user's body, or other effects on antenna, he explained that as long as the user's head or body is more than 20cm from the unit there will be no multipath. The most common use of the VS will be on a graduated monopole, and it's designed so the reading from the pole can be input into the controller. Javad pointed out that although the product ad shows the unit in use with an antenna on a two-meter pole, an external antenna is not necessary. Say, for example, that someone is surveying in ten-foot high corn. As another example, external antennas can be used for monitoring applications.

Responding to a question about why the Triumph technology has so many channels, Javad provided an easy-to-understand analogy: "Say there's one star in the sky and you have one pair of binoculars to locate it. Wouldn't you rather have 25 or more pairs of binoculars to look for it? Because Triumph technology provides 216 channels, more channels can be used to search for signals. Additionally, each satellite, once located, can occupy as many as eight channels, one for each signal. Future satellites, with more signals will require more channels per satellite, so the Triumph has plenty of room for expansion when Galileo and Compass are aloft."

Responding to another question about dealers and training, Javad explained that what he has designed will not require extensive training. "The price will be the same whether you buy online or from a dealer, and if you buy from a dealer, all you'll need for training



is five minutes." He feels that if a camera is the same price online or from a store, buyers will purchase it from a store. He used a total station and an iPhone as examples of products that require very little, if any, training. They just work. I was impressed by the fact that about

20 pages pages of tutorials and over three hundred pages of the captions that run along the bottom of each screen are contained within the VS. And with Internet connectivity, the user can send a question to tech support from the VS and receive the answer right in the unit.

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Two of four state-of-the-art board assembly lines in JAVAD EMS facility in San Jose. While many manufacturers are going overseas for board production, Javad's slogan for the state-of-the-art EMS facility is "California is Back to Build."

As for dealer concerns about the need for increased profit margins to pay for user support, Javad says his gear has no need for that safety net and does not need much training and dealer overhead. To back this up, Javad is offering a 30-day satisfaction-guaranteed, money back (plus \$1.00) policy. Basic instructions will be printed on all six sides of the box the unit comes in. Says Javad, "If you know what a base station and rover is, if you know what UHF, GSM, USB and Ethernet are, and you are willing to spend one hour with a VS, if you don't think the unit is easier than anything you've worked with, simply return it, no questions asked."

In a future issue we'll tell more about the manufacturing facility and EMS board production. With all the "necessary pieces" in place, Javad says he is having fun and expects his development pace to increase dramatically. I've chronicled Javad's life in articles over the past 10 years, and have been proud to share his uniquely-American success story. As he said in 2000, "Those who think GPS technology has reached its maturation are showing the limits of their knowledge or imagination. We have a long way to go." Stay tuned. *AC*

Marc Cheves is Editor of the magazine.