

# THE American Surveyor

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

January 2009

## Sands of Time

### The Business of Surveying

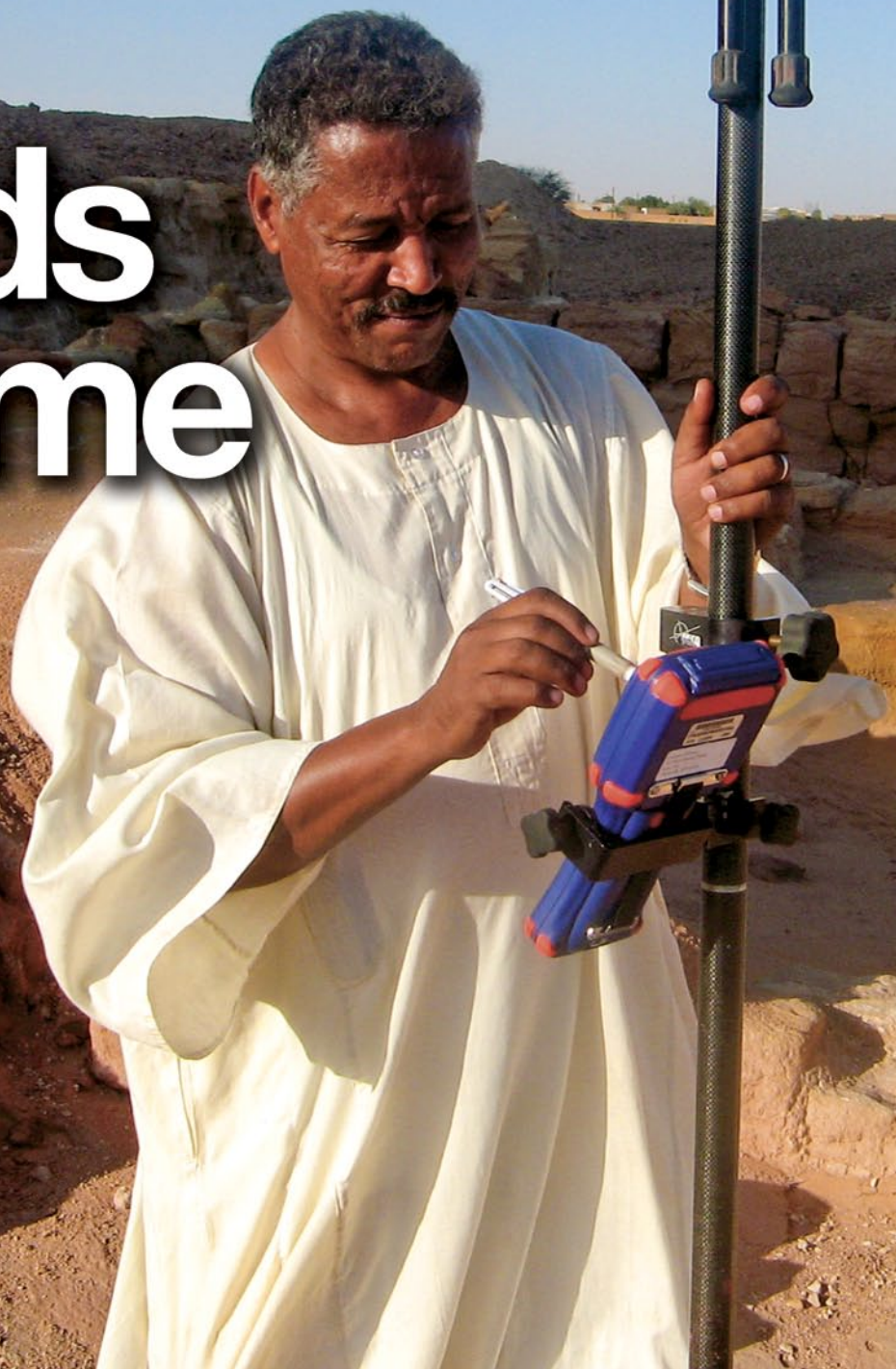
People, Product and Profits

### JAVAD GNSS Conference

1st annual meeting  
a success

### Gear Review

Spectra Precision  
EPOCH 25



Javad Ashjaee is pictured here on the glass-walled veranda that surrounds his penthouse in the Triumph Palace. The penthouse occupies the 54th & 55th floors of the tower. The Palace is currently the tallest occupied residential skyscraper in Europe, hence the aircraft warning lights. In the background is Moscow's first military airport, which has been re-purposed. Muscovites refer to the contemporary semi-circular building on the right as The Ear."



# JAVAD GNSS USER CONFERENCE

**U**nder pleasant sunny skies, I gathered last July with nearly 70 users and dealers from around the world to attend the first annual JAVAD GNSS User Conference in Moscow. At the time, the first order of 100 Triumph-1 receivers was being distributed, and a second production run of 1,000 receivers was in progress at the JAVAD production facility in San Jose, California. Yet to come was another of JAVAD's revolutionary developments, the Triumph-4X for RTK. Because the 4X incorporates four receivers in one, 16 baselines are created for each RTK task, thereby making the work faster and more accurate. Delivery of the 4X is expected this month.

Javad Ashjaee, founder of JAVAD GNSS, welcomed the crowd and provided a bit of company history, kicking off a

fast-paced three-day program that covered all aspects of the new JAVAD offerings. He proudly spoke of the depth of expertise his scientists and project managers possess, many of whom have been with him for 15–16 years. Individually, the scientists conducted the various presentations and program sessions.

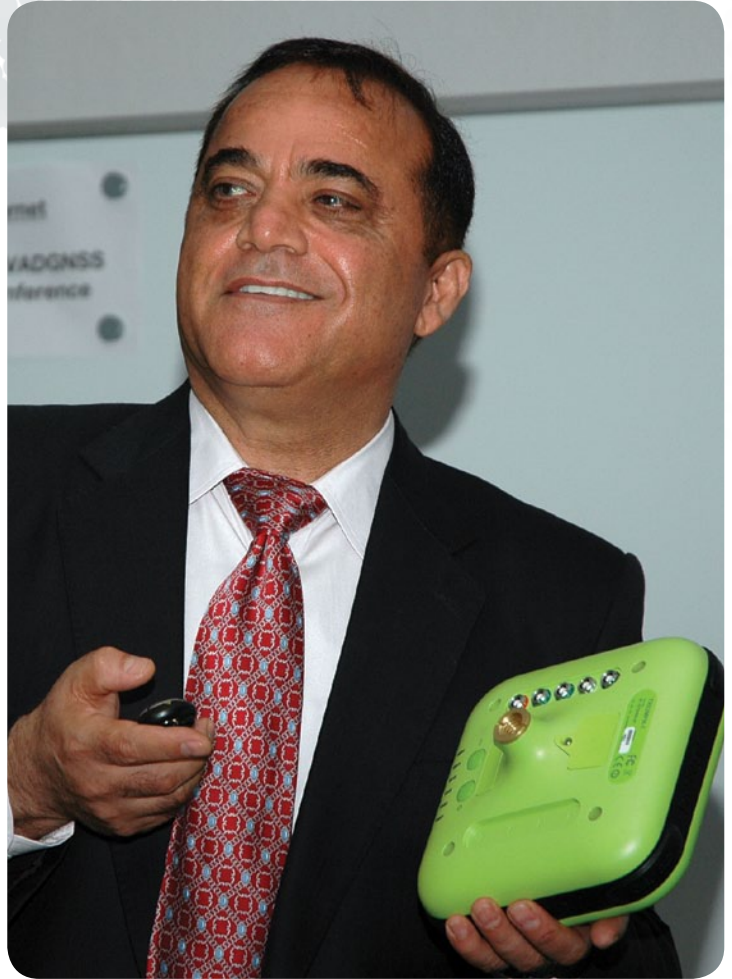
In Javad's words the company's equipment represents "not just buzzwords, but true technical advancement." When I first interviewed him in 2001, his company slogan was "Number One in the World, Second to None." Now, as he says, "We are back to lead again with Triumph!" It's a triple entendre—the Triumph technology is named after the enormous new office building in Moscow that houses both his company and his penthouse residence.

In discussing the heart of his receivers, the new 216-channel Triumph chip, Javad pointed out that the chip's 0.09 micron

>> By Marc Cheves, LS



Outdoor demonstration of Triumph-1



Javad discusses the Triumph-1

### Javad's long career demonstrates a track record of technical innovation:

- 1976** Graduated from Univ. of Iowa; masters degree in mathematics, masters and PhD in electrical engineering
- 1981** Pioneered high precision GPS for Trimble
- 1987** Founded Ashtech
- 1989** Became U.S. citizen
- 1996** Founded Javad Positioning Systems (JPS)
- 2000** Limited acquisition of JPS by Topcon Positioning Systems (TPS); founded Javad Navigation Systems (JNS)
- 2006** Founded JAVAD GNSS

technology allows it to run faster, require less power, and have more capability integrated on the chip. The chip can resolve—but not measure, due to other error sources—phase signals to 0.005mm and code signals to 5mm. Javad claims it is the only chip today that includes channels for Galileo's memory code and that TRIUMPH products are the only products in mass production for GPS+GLONASS+Galileo.

On display was the innovative RTK caddy holding a TRIUMPH-4X and three additional antennas mounted in an umbrella configuration. Based on a golf cart design, the benefits of the umbrella will be obvious under tree canopy: often the movement of the antenna by less than a foot will open a "path" to the sky. The umbrella makes moving the pole around unnecessary. The caddy design will prove particularly useful to GIS data gatherers.

In an outdoor demonstration, the attendees witnessed first-hand the nearly instantaneous acquisition of a precise RTK location made possible by the

state-of-the-art Triumph chip. A unique range pole extension houses the RTK antenna, thereby eliminating all external cables. The pole antenna receives full-band UHF signals as well as GSM. The receiver supports Bluetooth and WiFi at speeds up to 54Mbps. Also internal is a 20-hour battery, which Javad believes will be sufficient for almost all uses. For those applications that require more, an external battery can be attached.

The Triumph-1 receiver also incorporates a host of unique features, including In Band Interference Rejection (IBIR) and superior handling of GLONASS signals. IBIR helps solve the problems some precise users experience during periods of the day when their equipment doesn't work due to external man-made radio interference. Javad explained the inter-channel bias errors in GLONASS satellites and detailed how the Triumph-1 receiver mitigates these errors by dynamically and continuously calibrating out the errors to an accuracy of 0.2 millimeters. And according to Javad, until the Russians

complete their current modernization efforts, the GLONASS signals won't be as useful for precise work as the GPS signals. Meanwhile, JAVAD technology has found a way around this disparity in usefulness by designing the receiver to mitigate it. Javad emphasized the receiver solutions will remain smooth and stable under fast-changing constellation visibility such as would occur in urban canyons or under tree canopy. High-dynamic applications—such as machine control—can take advantage of the receiver's 100Hz update rate and 100Hz RTK.

One session covered the wide range of NGS-certified antennas as well as internal and external modems. According to Javad, while other manufacturers offer multiple modems to cover the range of frequencies, the JAVAD modem covers the entire world with one design. He says their unique UHF radio technology eliminates interference with the receiver.

Another session demonstrated the JAVAD Victor handheld controller. Based on a Juniper Systems design, the controller runs JAVAD Tracy software. This easy-to-use software incorporates three on-screen "buttons" that provide everything most users will ever need. In essence, "green means go," so once the buttons light up green, one or two clicks will begin gathering data. Also innovative is a built-in field-office online data exchange capability. For those applications not using an external controller, the six lights on the receiver will provide the user with all relevant information. The keyboard for the controller is translatable and customizable, and, like the receivers, incorporates online option authorization files when the user wants to upgrade to more capability.

Tracy software supports all existing or planned GNSS systems, and directly converts from NAD27 to NAD83; no conversion to WGS84 is necessary. Of the approximately 125 JAVAD scientists, eight are geodesists dedicated to working on transformations alone. With the depth of the Moscow scientific team, changes and improvements can be accomplished within days, not weeks or months.

The Justin surveying/GIS package was presented next. All of Javad's



Outdoor demonstration of Triumph-1 RTK rovers (Triumph Palace in background)

state-of-the-art software packages take advantage of the latest in the burgeoning availability of aerial and space-based imagery such as Google Earth. Javad stated that generally, 90 percent of surveying uses RTK while only 10 percent uses post-processing, and that only 10 percent of surveys start with a blank sheet as opposed to adding data to an existing map. Justin incorporates many new raster registration features, including its ability to work with any coordinate system and get control point coordinates from a map automatically.

Javad discussed the new online support forum that will include answers to the most commonly-asked questions. Because the company has people located all over the world, Javad claims any questions not quickly answered by the dealers will be responded to within 24 hours. He mentioned that, over time, the FAQs will grow to answer almost all questions, but in any event, the online support will answer all questions within 24 hours.

Dispelling rumors that users will only be able to buy equipment online from the company website, Javad said that unless users have no dealer or don't like their dealer, the company expects most sales to be made through the dealer network. Customers can achieve up to a 75 percent discount by ordering the options they need at the time of purchase, providing an overall cost-savings benefit since they will not be charged for things they don't need. Dealers can add value to the price by providing such things as special training.

A highlight of the conference was a presentation on GLONASS by Sergei Revnivkykh from ROSKOSMOS, the Russian equivalent of NASA, who is responsible for design, deployment and operation of GLONASS satellites. Revnivkykh admitted that, through the 1990s, investment in the system languished, but that now, funding has been assured, partly because the funding has been separated from the Russian space program. Modernization plans include an eventual constellation of 30 satellites, better clocks, longer satellite life (seven years versus the current three years), a switch to CDMA for signal transmission, interoperability and compatibility with other GNSS systems, and a global ground control segment like GPS (as opposed to the current Russia-only ground control stations). He assured the group that GLONASS signals will remain free, and expects these positive



JAVAD GNSS Victor handheld controller



One of the many scientists at work

developments to start taking effect by 2010. Revnivkykh pointed out that the differences between the constellations will provide robustness, especially if they are compatible and interoperable. Responding to a question—long posed by Galileo proponents—about who will assume the liability for GNSS, Revnivkykh said that, while the new constellations will have better built-in integrity-monitoring, he expects the secondary service providers to be

responsible for any liability. Revnivkykh also mentioned the close cooperation of ROSKOSMOS and JAVAD GNSS. Later, Javad said the company also has a close relationship with the Galileo authorities and is an associate member of the Galileo organization.

In the presentation about Giodis, Javad's geodetic post-processing package, I was impressed by the availability of the powerful GNSS Receiver External Interface Specification (GREIS) set of



Every Thursday evening at 7:00 PM, a teleconference is held with the various JAVAD GNSS offices around the world to check the status of every board, chip and part.

receiver communication commands that will allow sophisticated users to gather a whole host of data in the manner in which they want to collect it. (GREIS is also used by Tracy and other controllers to communicate with the receivers.) Not for the normal everyday user, Godis has precision that is equal to scientific packages. The software, which removes trivial vectors automatically, is not designed for global positioning, but rather for vectors out to 400-500km.

Following the information-packed technical sessions, many participants took advantage of the proximity to St. Petersburg and traveled there to take in some sightseeing. After that, more than 150 employees, their families, and other guests took part in the annual JAVAD company party outside Moscow. Everyone enjoyed the festivities, especially the children. A highlight of the party was an operatic performance by three professional Russian opera singers accompanied by professional musicians.

Javad has a long history of innovative ideas, from the Cinderella Option back in 1999 whereby GLONASS was automatically turned on every Tuesday so the users could see the benefit for themselves,



Triumph-1 GNSS receivers coming off the production line in San Jose

to his current Stimulus Package for surveyors (see the November issue of *The American Surveyor*). He feels he is well positioned to weather this economic down turn and help others to grow and upgrade. His latest product, GISmore, is a small receiver, self-contained in a hard hat that will enable users to just walk around gathering data with just a handheld. No more pole or backpack!

From the advanced degrees he obtained here, to becoming an American citizen, to the success he has had in all his various companies and affiliations, Javad is a true American success story. And even though his technology is developed in

Moscow, the gear is made in this country in San Jose. While most U.S. companies export technology and import products (even the iPhone is made in China), JAVAD GNSS imports technology and export products. By creating affordable, portable GPS devices for the past nearly 30 years, surveyors all over the world have benefitted from Javad's passion for precise positioning. The company is in it for the long run. It's hard to even imagine how far the GNSS envelope may be pushed in the future, but *wherever* it is, no doubt JAVAD will be there. *A*

Marc Cheves is Editor of the magazine.