# A Sharper Image

## Improving the view from Space

By Ed White

Thirty years ago the only locational data available to a Soldier in the field was a map. The problem with most maps was that they were old, the cultural information was outdated and, in many cases, just plain wrong. When satellite imagery came along, our government leapt on the new technology. The U.S. government built satellites and put them in orbit and they produced excellent imagery products that people within the various governmental departments could use. Problem solved, right?

Wrong. The images were so highly classified that a Soldier in the field never saw the images. In other words, the people who may arguably have had the most need for the geospatial products were denied access because they did not have the security classifications required to view the images.

"Those early images were head and shoulders above what a map could provide," said Roger Ward, a Multi-Spectral Imagery veteran since 1994. "A map is essentially a conceptual drawing with cultural information like churches, homes, schools, roads and airports annotated to give the map user a good idea of what actually exists on the ground. Most maps are printed, and then they are updated every five years or even longer. A satellite image gives the user an actual photo image of what is on the ground. The maps can be updated every day if necessary and using the digital format, a huge amount of ancillary information can be gained from the image," Ward added.

"The difference in the quality of commercial imagery from the early nineties until now is that currently we have a much better resolution quality because we have a much greater number of newer generation satellites to pass us information," said Ward. "We get much better spectral, spatial, radiometric, and temporal information, all of which can be applied to making better, more accurate and tailored products. It is like night and day from ten years ago," he added.

Army Space Command had built a program in the late 1980s and early 1990s called the Army Space Exploitation and Demonstration Program (ASEDP). It was headed by a forward thinking former Soldier named Bill Whelan. The purpose of the program was to take, commercial-off-the-shelf Space products and capabilities, analyze them and determine if they had any value to the Soldier. If the Soldier response was favorable, the technologies were given to the Soldier. The ASEDP team members would train them on how to use the technology and provide support as the particular capability went forward with the warfighter. Notable successes of this program were the introduction of the Global Positioning System (GPS) location device, the Portable Lightweight GPS Receiver, during Operation Desert Shield/Desert Storm, and a family of suitcase-to-briefcase sized portable satellite communications devices using the INMARSAT constellation for worldwide communications capabilities.

Whelan's team saw the value of imagery to the warfighter and they began to look into purchasing commercial imagery to support warfighter operations. The primary reason for this interest was that there were no security classifications, and all you had to do was get a purchasing agreement from one of the two primary companies that had satellites in orbit. The companies were LANDSAT (U.S.) and SPOT (French). The imagery was not as good as what the national satellite systems could provide. SPOT was 10 meter imagery, meaning that every visible pixel on the map represented 10 square meters on the ground. Still, this was a vast improvement over the old maps.

What grew out of this ASEDP effort was the Remote Sensing Branch. The ASEDP introduced the Army Space Support Team (ARSST) concept to the Army and the Remote Sensing Branch was born to support the ARSST. The branch began collecting a library of satellite images of potential hotspots in the world and would provide them to warfighters as they deployed. Well, news of a good thing spreads quickly. Pretty soon the branch was receiving requests from Corps and Divisional terrain teams looking for imagery that they could use for both planning and operational requirements.

A pivotal request for support came in 1998 from Joint Task Force-7 working the emergency response efforts around Hurricane Mitch.

This was a devastating hurricane and the subsequent mudslides killed hundreds in Central America. The Remote Sensing Branch provided imagery to show traffic ability of roads, last known locations of villages and towns and changes in the coastline. The imagery that was provided to JTF-7 proved to be highly valuable to the rescue and rebuilding efforts in the aftermath of the storm. This was the first time that this kind of imagery was produced to help in the recovery efforts of a civil disaster.

In the meantime, the Remote Sensing Branch supported the ARSST deployed during operations in Haiti. Over these years, the node also provided imagery in support of forest firefighting efforts in Arizona, Utah, Wyoming and Colorado. Infrared imagery is capable of showing hotspots that need to be addressed to prevent flare ups of the fire. Providing daily updates enhanced the ability of the firefighters to more quickly and effectively contain and control the fires.

The Remote Sensing Branch received many calls during emergency operations from the Department of Defense. After local news did a story on the branch and its capabilities, calls would occasionally come in from local police departments wanting the node to find stolen cars, bodies and caches of drugs. "We were not capable of that," said Ward. "We had to turn those calls down."

But when tribal violence erupted in Africa, the Remote Sensing Branch went into high gear and had imagery maps ready and in the hands of the U.S. Central Command team sent in to evaluate any response that might be required. The team had the images in their hands within 36 hours.

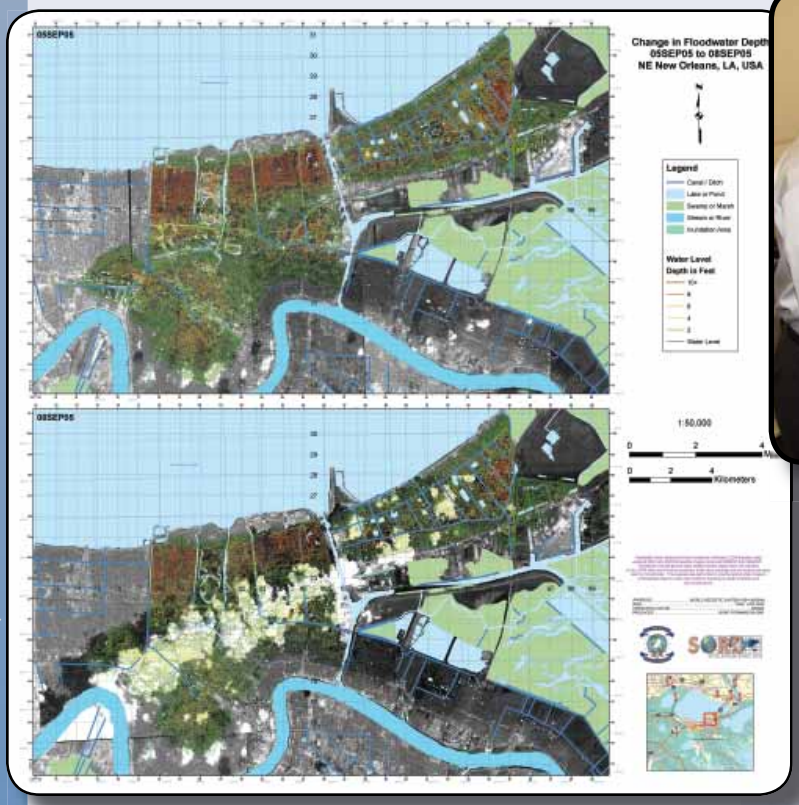
"That is how responsive we can be," Ward added.

The Remote Sensing Branch grew from an original crew of three analysts and an Officer-In- Charge in the mid 1990s to the 13 analysts and five administrative staffers onsite today. And whether it has been known as the Remote Sensing Branch, the Spectral Operations Resource Center or the now Measurements and Signatures Intelligence-Advanced Geospatial Intelligence Node, the products are still aimed at helping Soldiers win decisively on the battlefield.

From an original array of two satellites to about eight available to the node today, the types of information and sophistication of analysis have only increased. They have gone from 10 meter resolution to less than one meter. They have gone from black and white images to color ones. They have depicted oil fields burning in Baghdad during both gulf wars and detected mass graves in Bosnia and Iraq, allowing loved ones the closure of burying their dead with honor.

"What we do here is important work," Ward said. "We save lives and time and resources so the warfighter can more effectively conduct the fight."

Brian Plaisted serves as a Senior Engineer supporting U.S. Army Space and Missile Defense Command/U.S. Army Forces Strategic Command's Measurement and Signatures Intelligence-Advanced Geospatial Intelligence Node in the areas of long and short range planning as well as general staff support. He has supported U.S. Army Space and Missile Defense Command/ U.S. Army Forces Strategic Command for the past five years to include overseeing the upgrade of the Eagle Vision II van and training for Commercial Exploitation Team (CET) deployments. He is a retired Army Engineer Officer with 20 years of service. He served three and a half years as the Chief, Remote Sensing Branch (predecessor to the MASINT-AGI Node) with Army Space Command working to incorporate commercial satellite imagery with operational forces. This included Army Space Exploitation and Demonstration Program (ASEDP) initiatives such as the Multi-Spectral Imagery Processor.



**Roger Ward, (right) Dave Christiansen, and Bill Bach examine a map of the flooded areas of New Orleans that was printed by the Measurement and Signatures Intelligence/Advanced Geospatial Intelligence Node.** *Photo by Ed White*

**The images to the left show the floodwater depth changes in New Orleans from Sept. 5 to Sept. 8. Commercial satellite images were acquired from DigitalGlobe. These source images were manipulated by the Spectral Operations Resource Center to show water depth and can then be compared to previous images to determine the change in floodwater depth.** *Image courtesy of the Measurement and Signals Intelligence/Advanced Geospatial Intelligence Node and Digital Globe*

The split image shown on the cover and on this page display the improvements made in Satellite Imagery over the past 10 years.

Cover - The left image is from the LANDSAT5 TM sensor taken in 1996 and the right image is from the QuickBird satellite taken in 2005.

Behind - The top half of the image is from the LANDSAT5 TM sensor, RGB composite (bands 3,2,1) pan-sharpened to 10 meter resolution. Image date: 3/26/1996. The bottom half is from the QuickBird imagery is RGB composite (bands 3,2,1) pan-sharpened to 1 meter resolution. Image date: 7/22/2005.

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