

# Leica Geosystems

## A Solid Bet

By Mary Jo Wagner

When veteran pilot, professional engineer and land surveyor Gary Grigsby took off from Rifle, Colo. last June in his helicopter and newly fitted LiDAR sensor and digital camera to survey a canyon, he harbored a shade of uncertainty about how well the technology would perform over the challenging terrain ahead.

"Though I was confident in the abilities of the LiDAR and camera system, I was still unsure how the technology would acquire the very high accuracy and density required while the helicopter was constantly maneuvering," explains Grigsby, president of Western Research & Development (WR&D), a small engineering and survey company based in Cheyenne, Wyo. "But it was flawless. And that both surprised and impressed me."

The high quality results of that survey were also a welcome relief for Grigsby, who one year prior, had broken his own rule and gambled that acquiring the Leica Geosystems' ALS60 LiDAR sensor and Leica RCD105 digital camera would boost his small company's growth.

"At the time, no other companies in the area were flying LiDAR or digital imaging surveys with a helicopter," says Grigsby. "That presented a business opportunity, but the investment was also a big risk for our small company. That's why I chose the Leica system. I knew it would bring us notable growth and new business."

Indeed, within only a few short months of fitting the Leica ALS60 sensor and RCD105 camera into WR&D's Bell 206L Long Ranger helicopter, Grigsby and his colleague Alan Moore, a project engineer, were testing the solidity of that risk in the Colorado canyon, meandering the narrow corridor and hugging its walls - at times to within 200 feet - at varying speeds, direction and changes in elevation to survey an existing power line. A veritable success in all aspects, the canyon project not only proved that acquiring the Leica technology was a solid bet, it was the

triumph WR&D needed to confidently pursue and pioneer new business developments and reap the rewards of an expanded service area, project portfolio and revenue stream.

### Rolling the dice

WR&D was predominantly an aircraft instrumentation research and development company when it began in 1983, but the R&D focus of WR&D has still remained strong through its shift into civil engineering, surveying and photogrammetry. While standard survey work has been a steady part of its diverse portfolio, historically, WR&D has left photogrammetry and LiDAR survey work to other companies. And that was a wasted opportunity, says Grigsby.



WR&D's Bell 206L Long Ranger equipped with a Leica ALS60 Corridor Mapper and Leica RCD105 digital camera.

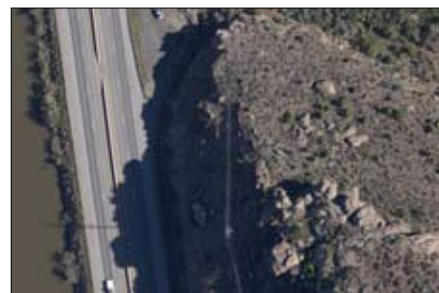
"As avid end users of photogrammetric and LiDAR data, we understand well how to acquire these data sources and how they can benefit our clients," says Grigsby. "Acquiring our own technology would afford us the business development tool to enhance our core business offerings, challenge the status quo of traditional survey applications and pioneer new uses of the techniques."

After a two year analysis of LiDAR and digital imaging technologies, WR&D chose to purchase both the Leica ALS60 Airborne Laser Scanner and the Leica RCD105 Digital Frame Camera, providing a versatile, high performance "plug and play" platform to collect very dense and very high resolution data.



"With the helicopter's low air speeds and altitudes, we can capture up to 150 LiDAR points per square meter and come to within three-tenths of a foot vertically," qualifies Grigsby. "That's extremely high accuracy and density. And with the pod-mounted RCD105, we can collect georeferenced photography at a two-inch pixel resolution."

The Colorado canyon survey, commissioned by engineering, architecture and surveying firm Merrick & Company, would be one of the first tests of this combined technology. Merrick tasked WR&D to capture 40 miles of an existing power line with both the ALS60 and the RCD105 to ultimately create very high-resolution orthophotos, 1-foot

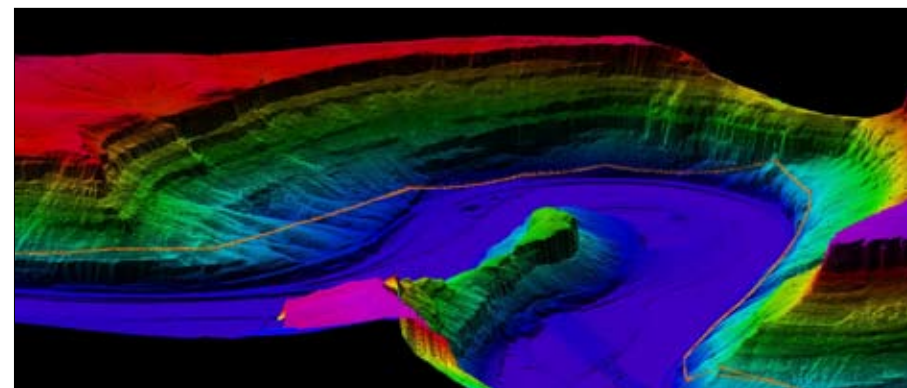


A high resolution image of a portion of the power line running along Interstate 70 and the Colorado River.

contours and a classified LiDAR digital elevation model.

### Into the canyon

In preparation for the aerial survey, Merrick sent ground crews into the field to map the position of the transmission line on the ground and provided the base map to WR&D. For a better visual of the area, personnel pinpointed the path of the power line in Google Earth, cross-checked it with the base map and noted any "blind" areas - spots where the line couldn't be identified in Google Earth or accurately mapped on the ground - that would require extra attention in flight. They then created the most efficient flight plan using Leica's Flight Planning and Evaluation Software and overlaid it onto



The meandering power line is clearly shown hugging the canyon walls in this 3D point cloud produced from Leica's ALS60 high density LiDAR data.

a Google Earth map. In mid-June Grigsby and Moore flew to Rifle for the survey.

Every morning for four days, a WR&D surveyor would set up two Leica 1200 GPS base stations while Grigsby and Moore prepared the imaging payload for the scheduled flight. Once in flight, Moore controlled the mission, monitoring the scanner returns and quality of the pictures in real-time, keeping a visual on the power line below the helicopter and instructing Grigsby of any needed lane changes. Grigsby says the stability of the Leica system was the one constant that they could confidently rely on throughout the ever-changing conditions.

"We would come across a plateau at 200 feet and suddenly the ground underneath would drop down to 1000 feet," he says. "Those drastic changes in elevation cause constant up drafts and

down drafts and wind shifts, causing our flight speed to vary and requiring frequent on-the-fly adjustments. Throughout it all, the Leica system performed perfectly. It automatically compensated for our variations in speed and elevation and alerted us if we exceeded speed."

Flying at an average speed of 60 knots and 1500 feet above the Colorado River, the team collected about 250 GB of raw LiDAR data - at 20 points per square meter - and photography of the winding power line from Rifle to Grand Junction. As the Leica RCD105 camera collects imagery in concert with the Leica ALS60, the two data sets were automatically tied together geographically by the on board airborne GPS and inertial measurement unit, as well as with GPS base stations, eliminating the need for ground targets and streamlining the post processing.

After each flight, Moore downloaded the data and performed quality control to ensure they had the coverage, accuracy and data density needed. They then sent the data to Merrick for post processing. Knowledgeable themselves with LiDAR and photography, the Merrick team was impressed with the accuracy and quality of the data sets.

"With the RCD105 imagery, we developed natural color orthophotos at a quarter-foot resolution," says Roger Hanson, director of operations at Merrick, based in Aurora, Colo. "That's very, very high-resolution imagery."

"Quite simply, the capabilities, features and quality of the Leica instruments allowed us to successfully complete this project," concludes Grigsby. "Leica provided us with a complete LiDAR/digital imaging package and have backed that with quality service."

Indeed, though WR&D is reaping the rewards of its successful gamble, it is unlikely Grigsby will try to transfer that winning luck to a blackjack table.

## CORPORATE PROFILE

### Leica Geosystems and Z/I Imaging – Airborne Sensor Solutions from Hexagon Geosystems

Hexagon Geosystems' newly formed Geospatial Solutions Division is bringing together Leica Geosystems' Airborne Sensors and Intergraph's Z/I Imaging solutions.

With over 80 years experience, Leica Geosystems is a global leader in the design, delivery and support of airborne digital sensors for the geospatial marketplace. Along with the well-known RC30, Leica Geosystems airborne sensor portfolio today includes a wide range of innovative technologies and products such as the RCD series of medium format digital frame cameras, the ADS pushbroom sensors, the ALS LiDAR series and the Leica IPAS GNSS/IMU solutions.

For nearly the same 80 years, Zeiss and later Z/I Imaging have set standards in the

airborne photogrammetric market with such products as the RMK series and the DMC. Today, Z/I Imaging continues to drive innovation and productivity with the new DMCII group of digital mapping cameras.

Sensors from Leica Geosystems and Z/I Imaging are fully integrated in a suite of end-to-end workflow solutions. These include flight planning, GNSS/IMU processing as well as the most comprehensive post-processing tools for the delivery of map products and 3D models in the fastest time possible. Hexagon Geosystems' combined airborne sensor portfolio of Leica Geosystems and Z/I sensors offers complete solutions for almost all airborne mapping applications plus all business

models and continues to give each sensor owner the highest and most consistent return on investment.

In addition to world class sensors, Hexagon Geosystems offers a full range of product support, service and training with offices located in over 25 countries worldwide.

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To find out more about airborne survey solutions, contact Leica Airborne Sensor Sales at **303-799-9453** or visit **[www.leica-geosystems.us](http://www.leica-geosystems.us)**

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