

Leica Geosystems Enters the Six-Side

The Future for its Geospatial Imaging Division

Just before Christmas (2005), a detailed and informative presentation was made to the publishers and editorial staff of *GeoInformatics* by Richard McKay (Vice President, Sales) and Sara Upchurch (Marketing Communications Manager) of the Geospatial Imaging Division of Leica Geosystems. The presentation first covered the events leading to the take-over of Leica Geosystems by Hexagon AB and the subsequent re-organisation of the company that has just been implemented. It then went on to outline the direction in which the Geospatial Imaging Division plans to go. This included information about the Division's forthcoming products and led to a most interesting discussion about the Division's planned future activities and developments.

by Gordon Petrie



Leica Geosystems has expanded its principal North American facility which now occupies a building with 100,000 sq. ft. floor area at the Technology Park in Norcross, near Atlanta, Georgia. The building houses the headquarters of the company's Geospatial Imaging Division.

The Takeover

To say that Leica Geosystems has had "an interesting" summer and autumn in 2005 would be a massive understatement. In early June, the company received an unsolicited take-over bid from the Swedish Hexagon AB organisation - which the Leica company's board of directors advised shareholders to turn down. Then, towards the end of July, it received another (higher valued) offer from the Danaher Corporation, an American company that manufactures tools and industrial measuring devices. The Leica board recommended shareholders to accept this new offer. However, in mid-August, Hexagon made a still higher offer for the shares of Leica Geosystems. This resulted in the Leica board withdrawing its recommendation regarding the Danaher offer and adopting a neutral position regarding the new Hexagon offer. By the end of September, Hexagon had received acceptances of its higher offer from over 70% of the Leica shareholders. By the end of October,

the figure had reached 98.5%. In early November, the original board of directors resigned and a new board was elected. This comprised the CEO (Ola Rollen) and CFO (Haken Halen) of Hexagon AB, together with the attorney and secretary of the previous board (Urs Brugger). With Hexagon's near 100% ownership of the shares of Leica Geosystems, the new board is applying to have the Leica shares delisted from the Swiss Stock Exchange (SWX) in Zürich. In which case, Leica Geosystems will become a privately held company owned by Hexagon.

Who are Hexagon?

That Hexagon AB was not well known to the geoinformatics world prior to its take-over of Leica Geosystems would be another understatement. It is however a well-known company in certain sectors of the automotive, construction and engineering industries. The company has three divisions:

- *Hexagon Engineering*: manufactures key components and systems, including the supply of industrial robots to the truck industry;
- *Hexagon Polymers*: manufacture plastic and rubber products (for example wheels), semi-finished products and extrusions for the automotive and construction industries;
- *Hexagon Metrology*: supplies measuring tools (such as gauges) and systems, including coordinate measuring machines (CMMs) and articulated arms to a wide spectrum of manufacturing industries. The activities of this last division are those closest to those of Leica Geosystems, especially in the area of metrology, where they overlap.

Re-organisation

As part of the Leica Geosystems company integration into Hexagon AB, a number of organisational changes are being implemented. Overall the existing Hexagon Metrology Division and the newly acquired Leica Geosystems company are to form the two major units within the newly-formed *Hexagon Measurement Technologies* business area. Besides which, Leica Geosystems itself has been re-organised into three divisions, instead of the previous six. These three new divisions are as follows:

- *Geosystems Division*: This comprises the former Surveying & Engineering Division (that manufactures GPS receivers, total stations, construction lasers and levels) and the High Definition Surveying (HDS) Division (which builds the Cyrax ground-based scanners). The activities of both of these divisions are centered in Heerbrugg, Switzerland. Also included in this new division is the special China sales region. The Geosystems Division has also taken over the airborne sensor manufacturing unit located in Heerbrugg - which was formerly under the Geospatial Imaging Division.
- *Geospatial Imaging Division*: This division has the same name as before and it is still based in Atlanta, Georgia. It will now concentrate its activities on software development and applications and on developing vertical markets. Bob Morris continues as President of the Division.
- *Measuring Tools Division*: Essentially this is a new name for the previous Consumer Products Division, whose principal product is the hugely popular Disto hand-held distance measuring device.

ed (Hexagon) World

- Finally the previous *Leica Metrology Division*: which produces laser trackers, probes and hand-held scanners as well as special industrial versions of Leica's total stations and theodolites - is to be integrated directly into Hexagon's Metrology Division.

Geospatial Imaging Division

With its new concentration on software, the Geospatial Imaging Division is planning to release new enhanced versions of its two principal products - the ERDAS IMAGINE remote sensing and image processing software suite and the Leica Photogrammetry Suite (LPS). In the near future, it will also introduce a new software product - the Leica Virtual Explorer.

ERDAS IMAGINE

Version 9 of this software suite will be released immediately (in January 2006). One of the highlights of this latest version will be an AutoSync tool that will allow automated image-to-image matching and geo-rectification of the imagery. The new version will also ensure compatibility of the geospatial image data processed by ERDAS IMAGINE with the Oracle Spatial 10g enterprise infrastructure. In this area, Leica has also entered into a strategic partnership with the Acquis company which already has a suite of tools that allow the handling of vector data and the topological editing of this data within the Oracle 10g environment. Besides these new features and capabilities, substantial improvements have been made to the vector editing capabilities of the package. Improved support has also been provided for ESRI's ArcSDE software and for the Map Composer Software. On the image processing side, better image quality results when a zooming-out operation is being carried out - the result of implementing a better pyramid layer algorithm. In addition, improved merge and pan-sharpening techniques have been provided in the new release.

Looking further ahead, users can expect the provision of automated or semi-automated feature extraction capabilities (especially road extraction) and the implementation of 64-bit processing in future versions of ERDAS IMAGINE. The official announcement and introduction of these major enhancements is targeted for the forthcoming ASPRS Annual Conference being held in Reno, Nevada during the first week of May this year.

Leica Photogrammetric Suite (LPS)

The latest Version 9 of this Suite will see the inclusion of a Mosaic Pro tool. This will allow previously rectified images or ortho-images to be mosaiced with both local and global balancing of the component images being implemented automatically. This will result in an improved quality of the final rectified image mosaic or ortho-image mosaic. Other improvements to the LPS Suite include new versions of both the ORIMA aerial triangulation package and the PRO600 vector map compilation software. The new Version 9 also allows the processing of the imagery acquired by the recently launched Indian Cartosat satellite - through the use of an RPC model.

Again looking to the future, LPS Version 9.1 is also planned for release at the ASPRS Reno meeting in May. It will feature improved 3D digital terrain model (DTM) data handling and greater visualization capabilities with up to 100 million points being accommodated and handled by this upgraded version of the Suite. Obviously this improved capability has been developed as a result of the widespread adoption of commercial airborne laser scanners such as Leica's own ALS40 and ALS50 and the several models available from Optech in Canada.

In 2001, when Leica Geosystems bought out BAE Systems' share of their LH Systems partnership, the principal loss was the well-established SOCET SET digital photogrammetric software which stayed with BAE Systems. As a result, many SOCET SET users, especially those in the defence mapping area, stayed with BAE Systems. However, since then, sales of the OrthoBase software - that was acquired when Leica took over ERDAS in 2001 and which has been further developed in the form of the LPS Suite - have risen steadily. As a result, the revenue from sales of LPS have now reached a level of 75% of that which LH Systems had with SOCET SET. In certain markets, there are strong local competitors - e.g. DAT/EM and Cardinal Systems in parts of North America; Suprosoft and China Siwei in China; Racurs in Russia. ISTAR's PixelFactory software is a real competitor in the specialized area of ortho-image production from pushbroom scanner imagery. However the three leaders in the digital photogrammetric software market, when viewed on a world-wide scale, are BAE



The Feature Analyst extension has been produced in collaboration with Visual Learning Systems (VLS). This aerial image of the Altdorf area in Switzerland shows the vectors defining roads, buildings, etc. that have been extracted using Feature Analyst.

Systems (SOCET SET), Intergraph (ImageStation) and Leica Geosystems (LPS).

Leica Virtual Explorer

Richard McKay also mentioned briefly the forthcoming Leica Virtual Explorer product that will provide a still more powerful set of 3D visualization tools that will be more or less transparent to the user. It will allow terabytes of information to be merged into a single "Digital Earth" - that can then be distributed to thousands of users world-wide without pre-processing. The city of Essen in Germany has been involved as the initial user and tester of this new package. It is available for purchase by customers immediately.

Extensions

Arising from the company's cooperation with Virtual Learning Systems (VLS) of Missoula, Montana, Leica had already released Feature Analyst for use with the ERDAS IMAGINE software. This introduced an automated or semi-automated feature extraction capability for well defined objects such as roads, buildings, etc. into the IMAGINE image processing environment. The Feature Analyst software has of course already been released as an extension to ESRI's ArcView and ArcGIS platforms.

Now Leica is releasing two further products as



A perspective view of part of the city of Calgary, Alberta in Canada that has been created using the new Leica Virtual Explorer V3.0 product

extensions to the ArcGIS 9.1 software. The Image Analysis extension includes the orthorectification of single frames of satellite and airborne pushbroom imagery and frame images, followed by the balancing and mosaicing of the resulting images. It also allows supervised and non-supervised land cover classification to be carried out together with change detection. Access to the functionality of the extension is made through the ESRI Arc Toolbox.

The StereoAnalyst extension offers users a 3D stereo feature collection capability within ArcGIS. This allows users to collect or update accurate GIS data and place it directly into an ESRI Geodatabase. Ground control is provided by a prior aerial triangulation (AT) carried out using either the Leica ORIMA, Intergraph ISAT or BAE Systems SOCET SET packages - since the extension can handle data in any one of the formats used in these leading packages. Support is also provided to allow users to utilize oriented stereo-image data from a number of high-resolution satellites such as IKONOS and QuickBird and for various commonly used 3D digitizing devices such as MouseTrak, TopoMouse and the Immersion Device.

Hardware

During the discussion following the presentation outlined above, inevitably this turned to the matter of airborne data acquisition - even though the Leica airborne sensors that generate this data and formed part of the Geospatial Imaging Division have now been re-assigned to the new Geosystems Division. Currently the three main suppliers of large-format airborne digital imagers - Leica (with its ADS40 pushbroom scanner), Intergraph (with its DMC frame camera) and Vexcel (with its UltraCam frame camera) - each have roughly equal shares of the market. Up till now, 37 ADS40 units have been delivered to cus-

tomers. However this figure may well have been increased - since the ADS40 is now the responsibility of the Geosystems Division. By contrast, the other potential competitors in this area - Jena-Optronik (JAS 150 pushbroom scanner), Wehrli Associates (DAS-1 pushbroom scanner) and DiMAC Systems (DiMAC frame camera) - only have prototype or development imagers operational at the present time.

As for the ALS50 airborne laser scanner, its production had already been moved from the former Azimuth facility in Massachusetts to the main factory in Heerbrugg - as indeed have the HDS ground-based laser scanners that were formerly manufactured at the Cyrax plant in California. The main competitors for the ALS50 are the airborne lidar products from Optech. Regarding the DSW700 photogrammetric film scanner, it is still selling in reasonable numbers - its main advantage over previous DSW models being the replacement of many mechanical parts with equivalent electronic components.

Terramatics

The discussion period also provided the opportunity to enquire about Leica Geosystems purchase of Terramatics Systems. This took place in July - at the same time as the initial Hexagon offer to take over Leica. Terramatics is a small systems house involved in inertial systems that is based in Calgary, Alberta. The company's *Inertial Position & Attitude System (IPAS)* is an integrated GPS/INS system developed on behalf of North West Geomatics - which is also located in Calgary and is a major customer of Leica's airborne sensors (RC30, ADS40 and ALS40). IPAS has also formed the basis of other customized GPS/INS solutions that have been developed for terrestrial, marine and airborne applications. According to the Canadian GEOIDE Network Web site, Terramatics was also funded during 2003/2004 as part of a team developing GPS/INS integration software using artificial neural networks (ANN) and wavelet multi-resolution analysis (WMRA). Furthermore, according to Wendy Watson (Vice-President of Product Marketing for the Leica Geospatial Imaging Division), the Terramatics technology is immediately applicable to the Leica sensor systems that are being used for airborne geospatial data acquisition.

All of which is very interesting and has caused the present writer (Gordon Petrie, not Richard McKay!) to speculate about what this might lead to. Leica's current airborne digital sensors - the ADS40 pushbroom scanner and ALS50 lidar - are both wholly dependent on the Applanix POS/AV (Position & Orientation System /Airborne Vehicle) which is a GPS/IMU system that has been integrated into both these sensor products. However the POS/AV system is also used by some of Leica's principal competitors in this area, like Intergraph and Vexcel. Furthermore, Applanix is now owned by Trimble, which is one of Leica's principal competitors in the area of optical surveying instrumentation, GPS receivers and ground-based laser scanners. Moreover one notices that the NovAtel company (like Terramatics, based in Calgary) - which has its own SPAN (Synchronized Position & Attitude Navigation) GPS/INS technology - has now been included as a strategic partner of Leica Geosystems as set out on the main corporate pages of the Leica Geosystems Web site. All of which causes me to wonder what this acquisition of Terramatics and the designation of NovAtel as a partner of Leica Geosystems might lead to in the future.

Conclusion

The Geospatial Imaging Division has had a tough year in 2005, largely caused by the considerable downturn in the U.S. defence market - due to much defence funding having been re-allocated to help support the conflicts in Iraq and Afghanistan. However Richard McKay clearly feels that the takeover by Hexagon has already had several positive results. The new owners have made it clear that there will be no sale of the Division and they have already assigned financial responsibilities and set targets for it to meet. They have also made it clear to the staff that there has to be an increased focus on customer requirements and an emphasis on those solutions and supplementary desktop products with enterprise-wide applications.

Professor G. Petrie (g.petrie@geog.gla.ac.uk) works with the Department of Geographical & Earth Sciences, University of Glasgow. More information on Leica Geosystems via www.leica-geosystems.com.