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thelink

Your Link to Leica Geosystems GIS & Mapping

Industry Outlook 2005

By Bob Morris, President,
Leica Geosystems GIS & Mapping

Throughout the coming year we expect to see significant activity in the geospatial imaging market place being driven by improved efficiency and economy in imagery management, workflow optimization and growing demand for imagery in decision support systems.

The progress toward all-digital workflows has driven a number of technological advancements. Satellite and airborne imagery are providing greater resolution and information content and pushbroom technology has significantly enhanced efficiency in airborne digital data acquisition. These improvements offer better quality and streamlined workflows, however high resolution digital acquisition also leads to very large data sets. Managing imagery along with the associated metadata can be a demanding task. To help address these issues, high performance and distributed computing are being employed to improve processing speed on large data sets, which are increasingly stored on web servers.

Additionally, with direct georeferencing, companies are improving the through-put time and are starting to meet the growing demand for "real-time" information. Measurement and analysis are expedited by advanced capabilities in semi-automated and automated feature extraction. 3D visualization facilitates image manipulation, opening access to a "virtual world." 3D imagery allows the viewer to explore options and angles that may provide insight as to how aspects of the landscape interact with each other, portraying the world more closely to how it is perceived.

As digital technology innovation progresses, users of nearly any skill level can utilize the growing number of off the shelf products for basic tasks and analysis, allowing specialists to focus on more advanced geospatial activities. No longer is the analysis of geospatial imagery relegated to the back office minority; executives, management or even administrators may all access and utilize this information for decision making.

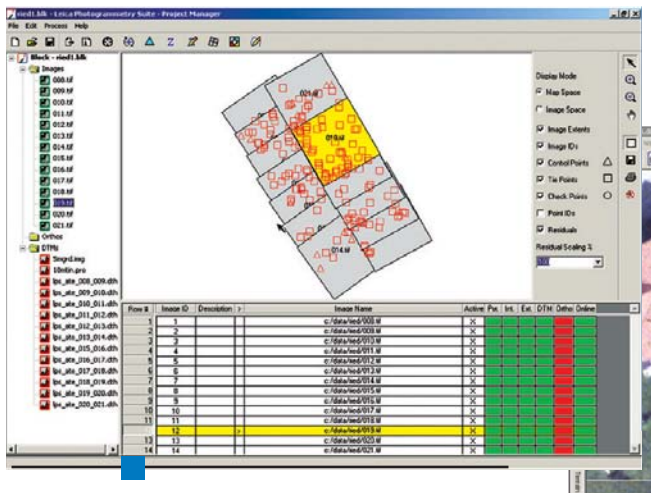
As a result of the inherent benefits of using imagery in the decision making process throughout the business spectrum, the trend in applications is toward verticalization — specific user applications designed toward a particular industry or function — rather than broad tools. Non-traditional markets will emerge, and vendors will need to diversify and partner with organizations able to offer specific vertical industry expertise.

The market for geospatial imaging is expanding and responding to real-world demands for fast, accurate, detailed information. Technological advances have enabled a broad spectrum of users to leverage and benefit from geospatial imaging. Eventually, we expect to see imagery seamlessly integrated into everyday activities, such as driving and travel planning, landscaping, real estate and countless other aspects of day to day life.

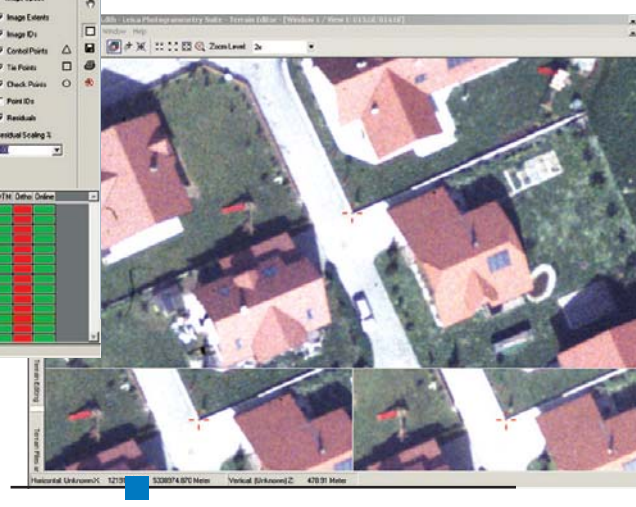
Leica Photogrammetry Suite Streamlines Workflow

A seamlessly integrated suite of digital photogrammetry products, Leica Photogrammetry Suite (LPS) from Leica Geosystems GIS & Mapping empowers geospatial professionals to create and put precise imaging to work quickly and easily. Leica Photogrammetry Suite automates the process of transforming raw imagery from a wide variety of formats into reliable data layers required for digital mapping, GIS analysis and 3D visualization. By streamlining projects into one fast, manageable workflow without compromising detail and accuracy, LPS encourages increased efficiency and productivity.

A process-driven workflow is the key to increased productivity, and a process-driven system that efficiently transforms imagery into reliable geospatial content is the engine that drives it.



Streamline production workflow with the LPS process driven toolbar and Project Manager.



Measure features more accurately with the subpixel positioning capabilities in LPS.

LPS has been designed as a process and workflow-driven solution to enable users to work efficiently, without jeopardizing accuracy or quality. Several features of LPS contribute to this, such as its intuitive user interface, mosaicking capabilities, and other key automated functions.

Intuitive Interface

LPS offers a clean, logical interface that makes it easy to learn and use. The workflow driven toolbar guides the process, giving users everything needed to create a photogrammetric project. The WorkFlow Toolbar guides users through projects from beginning to end and puts image processing tools right at user fingertips.

Mosaicking

Mapping professionals are seeking effective ways to address mosaicking as they face increasing pressure to produce large volumes of geospatial information quickly, coupled with an even greater demand for accuracy. Moving between various software packages or working with a GIS system that is not designed to handle mosaicking functions can be frustrating, time consuming and poses a risk of data loss. Mosaicking with LPS is performed as a process and includes simultaneous color balancing, and mosaicking — removing the need for third-party software. Cutlines, the boundaries between overlapping images in the mosaic, can be generated automatically or customized by the user. LPS attempts to place cutlines between the images so they follow naturally occurring lines such as roads, buildings and waterways, to minimize the appearance of an image boundary. Feathering used to further disguise image boundaries, resulting in a smooth transition from one image to another, with little or no noticeable boundary. By utilizing LPS, the intensive process of mosaicking is simplified and expedited, permitting users to focus on analysis.

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In this issue

capture

Leica Geosystems GIS & Mapping introduces the DSW700 Digital Scanning Workstation

Continuing its tradition as industry leader in commercial photogrammetric production scanning, Leica Geosystems GIS & Mapping recently introduced the DSW700 Digital Scanning Workstation. The availability of the DSW700, brings to the marketplace a new high performance scanner and components that enable updating of previous models with the latest technology as well.

High performance scanning is a key ingredient in a successful digital photogrammetric production workflow. In order to meet the demands of projects that often necessitate overnight roll-film scans, production photogrammetrists require high optical resolution at a very high speed.

The Leica DSW700 Digital Scanning Workstation offers higher performance, greater functionality and improved return on investment. With precision scanning of color or black and white film transparencies on both cut and roll film, the DSW700 provides digitized image data to digital photogrammetric workstations running Leica Photogrammetry Suite (LPS), ERDAS IMAGINE® software and any digital photogrammetry or image analysis systems.

Commercial scanner users rely on scanning systems to process major photogrammetry jobs with consistent accuracy, without the need for many adjustments. In order to achieve optimal results without correction, it is essential that the initial scanning process facilitate getting as true an image as possible.

The DSW700 features a new three color LED light source, to enable more consistent illumination, increasing the illuminated area to accommodate a larger sensor. The new design prevents dust and dirt accumulation during scanning, with a minimized optical path which goes directly to the digital sensor. The direct LED light source also keeps the stage and optical path free from unwanted heat sources, ultimately leading to improved image quality.

In addition to enhancing the image quality, the new LED light source also provides a more efficient implementation of sequential color capture than ever before, resulting in three band color captures with speeds comparable to black and white captures in previous models. When combined with the high performance sensor, the three color LED light source reduces capture noise, produces faster capture time and improves tonal sensitivity for an essentially distortion free image.

The phenomenon of Newton rings, formed by space in between pressure plates, has become a common by-product of scanned images. The DSW700 features anti-reflective glass on the stage and cover plates to reduce the amount of reflection between the pressure plates, dramatically reducing — and in some cases eliminating — the visibility of Newton rings.

Consistency in the basic design of all DSW models makes it easy for current Leica DSW scanner customers to upgrade their systems to DSW700 status. Old components can quickly and easily be replaced in the field with the enhanced components of the DSW700. The easy upgrade path protects the initial investment, offering customers a cost-effective way to enjoy the increased productivity and improved quality of the newest technology without replacing their entire system.

The DSW700 Digital Scanning workstation now uses a high intensity three color LED light source.

The DSW700 improves on key technologies to provide a faster, more accurate and productive scanner. Improved speed and functionality, enhanced image capture capabilities and great return on investment value combine to make the Leica DSW700 Digital Scanning Workstation a market leader in high performance scanning.

Cooper Aerial Surveys Company is first sale of DSW700 Digital Scanning Workstation

Using the DSW700, a color air photograph can be scanned in approximately 3-1/2 minutes.

Leica Geosystems GIS & Mapping recently announced the initial sale of the DSW700 Digital Scanning Workstation to Cooper Aerial Surveys Company.

Cooper Aerial is a multidisciplinary aerial photography and mapping company founded in 1966, which serves engineering firms, the mining industry, architectural firms, real estate developers, and municipal, state and local governments. The company has offices in Phoenix, Tucson, and Hermosillo, Sonora, Mexico.

Cooper Aerial has a longstanding relationship with Leica Geosystems; the company employs a Leica RC30 Aerial Camera System for its photography services, and has owned a DSW200 for several years. The DSW700 will enable Cooper Aerial to offer its customers faster turnaround and higher resolution on every scan.

"The Leica Geosystems DSW700 is already helping us to streamline our digital workflow. We expect the scanner to pay for itself within the next year and a half," said Robert Murphy, vice president of Cooper Aerial Surveys Company. "With the DSW700, we can be confident in planning and executing all phases of a project in-house."

"Cooper Aerial has been a stellar customer of ours for several years, and we are proud to help Cooper provide its customers with geometrically and radiometrically accurate scans, while maximizing performance, increasing reliability and reducing costs," added Richard McKay, vice president of sales for Leica Geosystems GIS & Mapping.

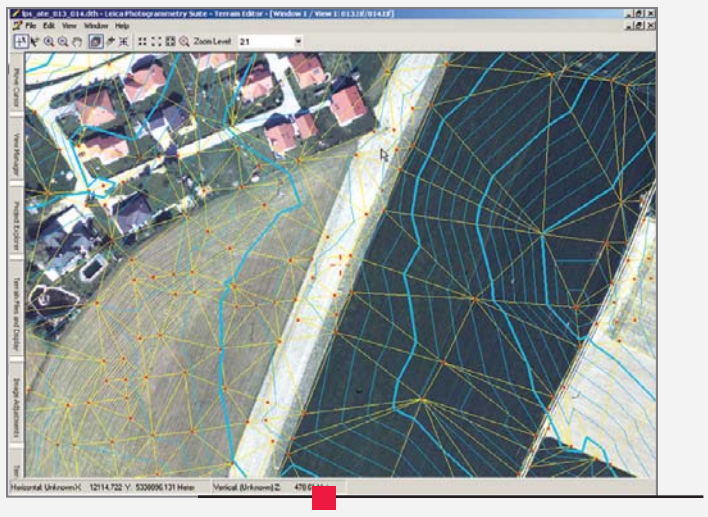
Leica Photogrammetry Suite: Completes Photogrammetric Workflow for All Organizations

Completing the photogrammetric workflow

Leica Photogrammetry Suite (LPS) fulfills all photogrammetric needs; its range of features will meet the requirements of any organization, from large national mapping agencies to single-person photogrammetric production shops. It also supports users with various levels of photogrammetric knowledge, from GIS analysts extracting building models for a 3D scene, to high-volume production photogrammetry firms triangulating thousands of images.

Features included in LPS:

- Block setup
- Automatic interior orientation
- Manual point measurement
- Automatic point measurement
- Triangulation
- Single frame orthorectification
- Mosaicking
- Simultaneous orthomosaicking
- Project management tools with the LPS Project Manager
- Numerous remote sensing tools (which can be used in conjunction with photogrammetric tools)



Use imagery as a reference to edit terrain features with increased accuracy.

Remote Sensing and Photogrammetry Integration

The geospatial community is working toward full integration of formerly disparate remote sensing and photogrammetry groups. In the past, remote sensing and photogrammetric processing were performed by separate groups using different software tools. With the seamless integration of LPS and ERDAS IMAGINE®, many organizations are starting to mix their processing and workflows. For example, a remote sensing group may perform a small aerotriangulation (AT) project in support of a digital orthophoto production effort. This enables the photogrammetric group to focus on its core competency — processing large volumes of imagery — without one-off projects interrupting its workflows.

Leica Geosystems GIS & Mapping strives to provide scaleable solutions that fit the needs of all customers.

- LPS is the only module-based photogrammetric package with so many features and functionalities in its Core module — the competition requires the purchase of several modules to achieve the same functionality
- LPS is designed to empower users with various levels of photogrammetric knowledge
- The strong functionality in LPS can be leveraged in streamlining workflows and photogrammetric processing

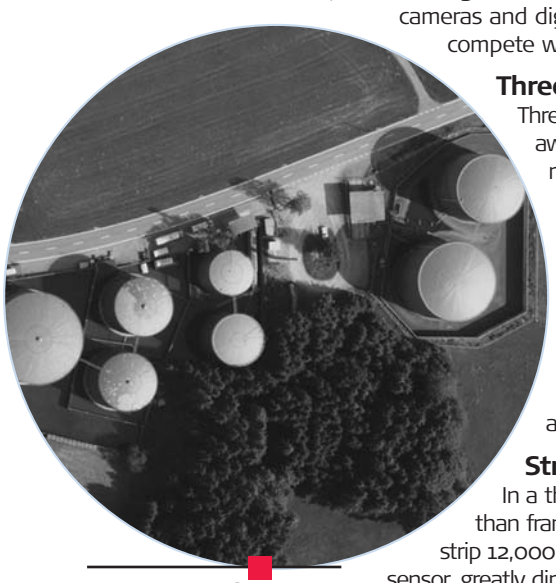
Did You Know

The new Mosaic Direct tool offers a direct means to orthomosaic digital photography

reference

Three-Line Sensors: Rapid, Efficient Digital Imagery

The age of digital airborne imaging has arrived. Although traditional frame cameras and scanners are still the most widely used methods of data acquisition, there is a noticeable shift in the market as new and improved digital sensors enter the market. Since its introduction, digital sensor technology has made great strides in automation and quality, and digital sensors are also helping enable streamlined, more integrated workflows. Leica Geosystems GIS & Mapping was the first vendor to enter the market with a commercial three-line sensor approach with the innovative ADS40 Airborne Digital Sensor. Many vendors are now offering small digital frame cameras and digital multi-patch frame cameras in an attempt to compete with the three-line sensor approach.



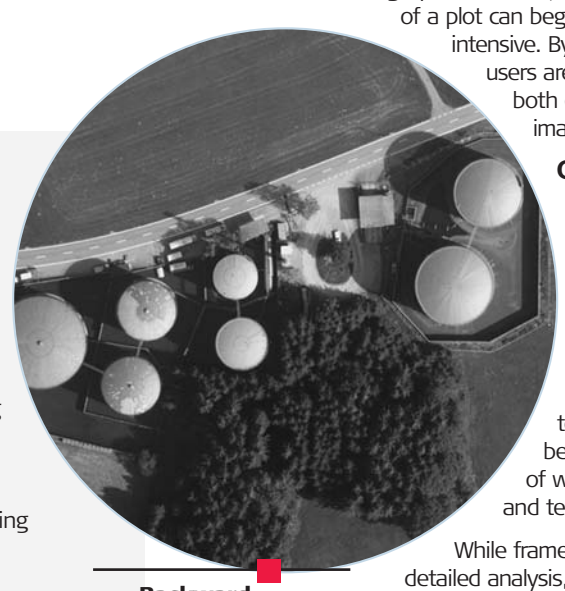
Forward

Three-Line Digital Airborne Sensors

Three-line digital airborne sensors are gaining industry awareness, quickly becoming the preferred sensors in the market. Three-line sensors capture three different views: forward, backward and nadir. This provides better insight into all parts of an imaged area, because the three strips for each view — the pixel carpets — offer 100 percent overlap from three perspectives. The three-line principle is based on the proven satellite design of a pushbroom type sensor and results in no dead zones or occluded areas. It enables the user to cover much larger areas of the earth's surface in record time, and at a lower cost than incurred when acquiring frame imagery.

Streamlined, Cost-Effective Workflow

In a three-line sensor, data is collected line by line, rather than frame by frame. The ADS40 produces a long, continuous strip 12,000 pixels wide. The pixel carpet output from a three-line sensor, greatly diminishes the need for mosaicking. With traditional frame imagery, users must join each frame to the adjacent images before analysis of a plot can begin. The mosaicking process is quite time and labor intensive. By reducing the time spent stitching images together, users are able to begin analysis sooner. This helps to improve both efficiency and cost-effectiveness on projects utilizing imagery produced by a three-line sensor.



Backward

Comprehensive Coverage

The three-line sensor can easily generate three-dimensional data of an area, as well as imagery for use in stereo analysis. Triplets produced by a three-line sensor (forward, backward and nadir) offer higher accuracy and enable the user to conduct more detailed analysis. For example, a building can be seen from three perspectives, which enables the user to have a better understanding of how the building relates to its surroundings. This comprehensive information can be used in simulations or analysis such as the interplay of wind with high-rise buildings, fire propagation, flooding, and telecommunications (such as cellular tower lines of sight).

While frame cameras can offer the high resolution required for highly detailed analysis, three-line sensors, with resolutions of up to five centimeters per pixel are better suited to larger projects. Although the pixel carpet files are quite large, today's complete systems can handle the load. As more high-volume storage devices are made available, especially for storing data onboard during a flight, the devices are also becoming smaller and can offer better, more efficient digital workflows.

The amount of useful information collected during a single flight with a digital sensor is approximately equal to the amount of information available after standard aerial photographs have been exposed and scanned. In fact, a three-line sensor can capture panchromatic, RGB and near-infrared images simultaneously; effectively tripling the amount of information collected.

The three-line sensor can easily generate three-dimensional data of an area, as well as imagery for use in stereo analysis.

With the advent of three-line sensors, what will become of frame mapping cameras? Frame imagery is not yet obsolete; and it won't be anytime soon. With development dollars being redirected from frame cameras to three-line digital imaging sensors, however, frame has certainly hit its peak. The three-line digital sensors' automated workflow, flexibility and high performance-to-price ratio is quickly becoming the preferred method for imagery acquisition.

LPS Workflow

continued from page 1

Automated Functions

Features such as automatic interior orientation, automatic tie point measurement, automatic terrain extraction and intelligent multiple-image loading enables users to focus on analysis and fine-tuning of data by removing the necessity to perform repetitive tasks. Parameters for calibrated cameras and lenses can be defined and saved within LPS, and users may define the internal geometry of imagery using measured fiducial marks. LPS can automatically determine the corresponding image positions of ground points appearing on multiple overlapping images. Additionally, LPS supports fully automatic generation of terrain from two or more images, and can extract subset and mosaic individual digital terrain models for an entire project area, encompassing hundreds of images with one click. These automated functions can save weeks on a large-scale project.

With LPS, Leica Geosystems continues to offer the latest photogrammetric production tools available and push forward as the leader in photogrammetric solutions. With its streamlined project workflow, uncompromising detail and accuracy, LPS becomes the photogrammetrist. Leica Photogrammetry Suite increases geospatial professionals' efficiency and productivity, empowering them to create and put precise imaging to work quickly and easily.

Did You Know

United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) has chosen Leica Photogrammetry Suite (LPS) as a key resource to support and streamline the National Resources Inventory

ADS40 pixel carpet of farmland in Southern Europe.

measure

U.S. Forest Service Improves Efficiency of Forest Inventories

The U.S. Forest Service Forest Inventory and Analysis Program (FIA) is responsible for inventorying the forested lands of the United States of America, both inside and outside national forest boundaries. Historically, inventories were conducted and estimates produced periodically, every five to twenty years. However, the 1998 Farm Bill requires that each year, ten to twenty percent of all U.S. lands must be measured, and forest population estimates must be updated.

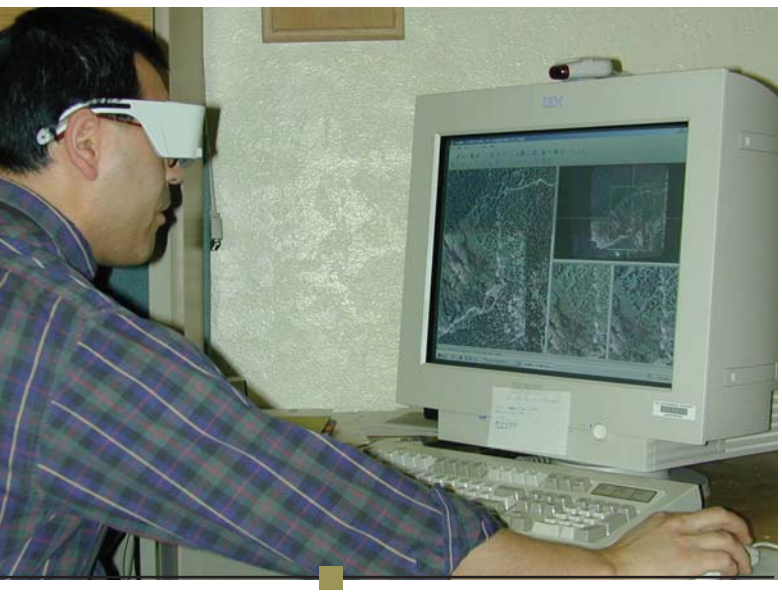
The increased frequency of inventories significantly drives up costs, especially in inhospitable locations. As a result, the Forest Service sought more efficient, cost-effective methods for executing the annual forest inventory.

Recent investigations show that large scale aerial photography, supplemented by traditional ground crew measurement, has potential to significantly reduce costs while maintaining a high level of accuracy.

Advances in Aerial Photography

Aerial photography has been employed in forest operations, such as direct measurement of trees and estimation of volume and growth, since the first half of the twentieth century. In recent years, there have been significant hardware and software advances, including the development of high resolution aerial photography film, the ability to scan this film at approximately the same resolution as the film emulsion grain size, and now the development of high resolution digital aerial cameras. Global Positioning Systems (GPS), pre-specified locations on the ground can be captured with aerial photographs.

The positional accuracy of aerial systems enables data to be captured within a few meters, providing an accurate source for measurements such as: ground coordinates, tree counts per area, tree height, percent crown closure, visible crown diameter, tree species, crown class, tree condition (living or dead), ground layer structure, patch sizes and shape, and vegetation type and land cover.



A comparison of ADS40 digital and RC30 analog film data characteristics.

Image courtesy of USFS RSAC

Precision vs. Cost

Use of aerial photography in forest inventories lowers overall cost, but there have been concerns about whether the cost savings come at the price of reduced precision. The Forest Service Remote Sensing Applications Center (RSAC), Interior West FIA and Red Castle Resources Inc. set out to determine the accuracy and cost effectiveness of using large scale digital aerial photos to sample FIA plots as part of its annual inventory. The project analyzed the precision of tree-height measurements from aerial photos and compared the cost of using ground crews to the cost of using aerial photos.

Study Details

The plots in this study are within the Fishlake National Forest in the heart of the pinyon-juniper forest's range in Utah. Pinyon-juniper forests are ideal for using photo interpretation (PI) methods. Not only is the low tree density conducive to using PI, but the slow growth rate of these trees is well-suited to double sampling because the tree size changes relatively little over a ten-year period.

The aerial photos of the FIA plots, obtained from a private contractor equipped with a Leica RC30 Aerial Camera System, were required to meet specifications of sun angle, overlap and scale. Three photos were collected for each plot to allow stereo viewing from two different perspectives. A second contractor scanned the photos, and these soft copy stereo pairs were imported into ERDAS IMAGINE®.

A block file was created for the images, using Leica Photogrammetry Suite. ERDAS IMAGINE was used to process the images; the Stereo Analyst® add-on for ERDAS IMAGINE was used to view the images in stereo, and to establish tree height measurements.

Measurement

FIA plots consist of four subplots systematically arranged around the location center (LC). Locating the plot LC on the aerial photo is the first step in any photo-based sampling. In the past, photo interpreters used hardcopy aerial photos, arranged for stereo viewing, to make measurements. Now, they can view and analyze soft copy scans of aerial photos, zooming into the stereo photos and capture very good detail at scales of 1:50. Once a tree was located on a newly acquired digital aerial photo, tree species was interpreted and tree-height was measured to the nearest decimeter.

Accurate Results

The results of this study showed that tree-height measurements made from aerial photographs are within the ten percent error allowed of FIA ground crews. Working from high resolution images, a photo interpreter can easily do the job of many field crews, compiling forest measurements within a relatively large continuous area, and it can be done with less training and expense.

"The ability to measure a tree's height using Stereo Analyst is remarkably precise. While some differences occur, they are within an allowable ten percent of true tree height as measured in the field," commented Kevin Megown of the U.S. Forest Service RSAC. "There are tremendous similarities between the ground height and photo-interpretation height measurements. The ability to measure tree height precisely using Stereo Analyst accomplishes one of this project's goals."

On The Horizon

Emerging markets... Expanding Opportunities in the Forestry Industry

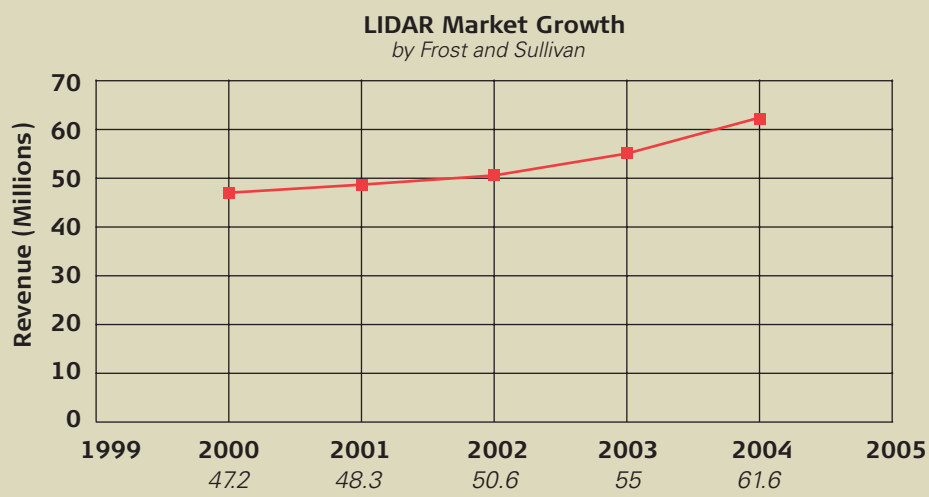
Aerial photography and the processing of the digital imagery are increasingly being used to gather valuable information in the forestry industry. The US Forest Service Inventory project demonstrates that geospatial imaging can play an integral role in collecting forest area information. The use of LIDAR technology is an effective and cost-efficient alternative to the manual information collection survey process, and can yield results that are equally as accurate.

Environmental conscientiousness, efficiency in forest management and increased demand of forest materials, among other factors, have led to a boost in the demand for forest inventory and associated statistics. Government and business entities are engaging in a variety of studies such as: the assessment of high fire risk areas; detection and tracking of insect infestations; harvesting of forest products; sizing of the forestry market; and environmental remediation assessment. LIDAR enables more comprehensive data collection for these types of projects.

Remote sensing with LIDAR technology facilitates better data gathering in remote locations. More precise readings of the height and density of trees allow for a more accurate representation of forest areas. The increased capabilities and enhanced functionality of geospatial hardware and software technology make it possible for decision makers to rely on the detailed and precise information that digital imagery provides. As this trend continues, LIDAR technology will continue to create opportunities for Leica Geosystems solutions in the forestry industry.

According to the North American Remote Sensing Report (Vertical Market Analysis 2004) LIDAR revenues related to the forestry industry will more than triple by 2010.

LIDAR Market Growth
by Frost and Sullivan



The many ways LIDAR is being used in Forestry

- Flood plain mapping
- Fishery monitoring & enforcement
- Wetland remediation
- Coastal and port construction
- Monitoring shoreline erosion
- 3D models of the terrain
- Planning for access to remote areas
- Analysis of atmospheric pollution
- Timber extraction
- Forest management
- Abiotic hazards: storms & fires
- Assistance with silviculture
- Monitoring re-vegetation and regrowth
- Assessing the environmental sustainability of logging
- Tracking forests' ability to soak up greenhouse gasses
- Mapping the movement of gasses, particles and pollutants in the atmosphere

Cost-Effective

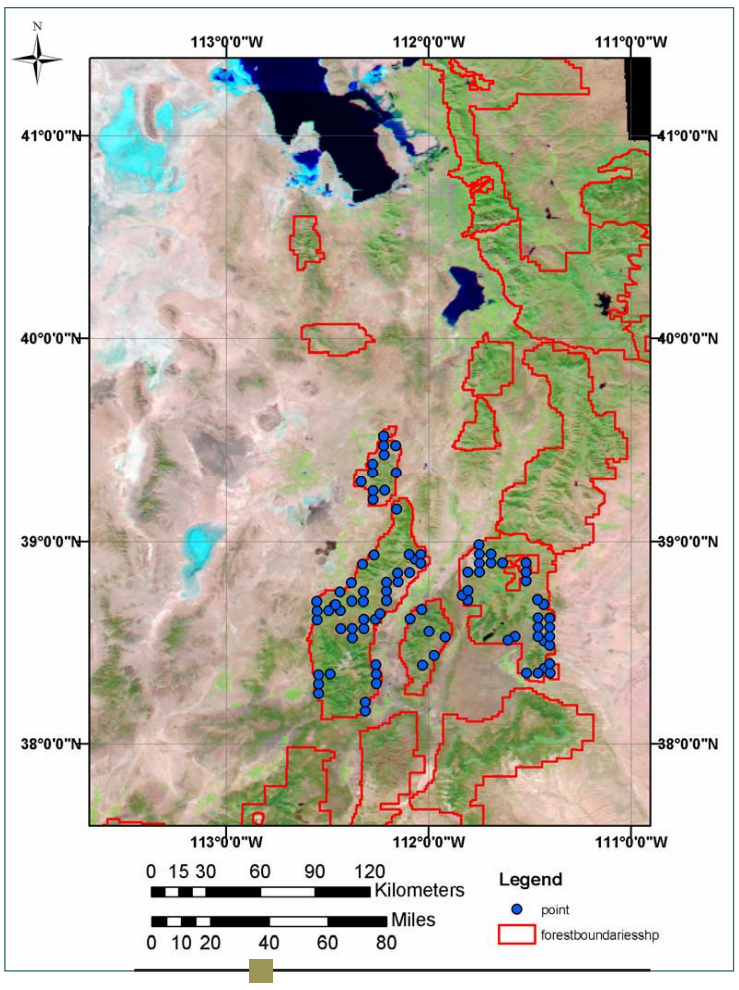
An analysis of cost versus precision for a pinyon-juniper forest demonstrates that over one third of the sampling costs can be saved by combining photo analysis and ground-plot sampling methods without affecting accuracy. The true cost of a sample would include both the cost of photo interpretation and ground based sampling required to perform a double sample. In this scenario, the first thirty plots require both ground sampling and aerial photography, setting a standardized control group, while subsequent plots may be recorded by photographs alone.

The difference in cost between measuring a plot on the ground, estimated at over $1500 per plot, and using photo-interpretation methods — approximately $510 per plot — provides a significant incentive for combined ground and photo-based sampling. For one hundred plots analyzed through combined ground survey and photo analysis, there would be a total savings of $54,000.

Additional Benefits

Additionally, the cost of using scanned analog 9x9 photos is considerably higher than if digital photos are acquired directly using a commercial-grade, high resolution digital camera, such as the Leica ADS40 Airborne Digital Sensor. It is estimated that using digital photos could reduce the per-plot photo acquisition cost by fifty percent and significantly improve the economic benefit of using PI methods.

Aerial photos offer more advantages than just saving money. Given a fixed budget, the time and money saved in inventorying some forests could be used to increase the amount of sampling in forests that are more difficult to assess or have a higher economic or ecologic value. The use of aerial photos can also foster a more spatial approach to generating information about forests. For example, building relationships between satellite data and the aerial photos could add another layer of efficiency to the inventory, while also providing more information about the distribution of the resource.



FIA Plot Locations
Fish Lake National Forest UT
Image courtesy of USFS RSAC

By combining traditional ground crews and aerial photography, the Forest Service will benefit from increased cost efficiency, while preserving accuracy and fulfilling its annual inventory requirements.

The work discussed within is developed for the guidance of employees of the U.S. Department of Agriculture (USDA) Forest Service, its contractors, and its cooperating federal and state governmental agencies. The Forest Service assumes no responsibility for the interpretation or application of information by other than its own employees. The use of trade names and identification of firms or corporations are for the convenience of the reader; they do not constitute official endorsement or approval by the United States government, other products or services may be equally suitable.

Product Tips and Tricks

Why is it necessary to use a common Look Up Table (LUT) with 16 bit and IKONOS multi-segment imagery?

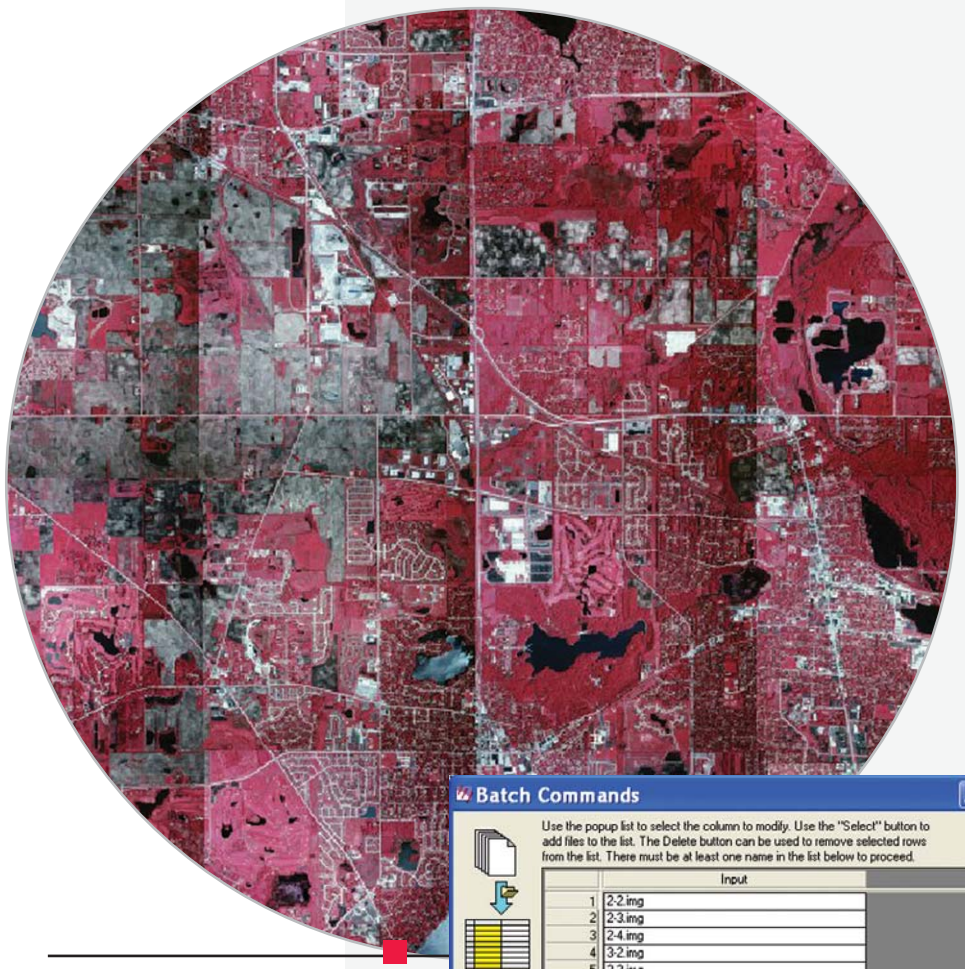
16 bit images (or 11 bit treated as 16 bit)are not displayed well on a 256 grey-level monitor. So ERDAS IMAGINE® generally splits the data into 256 bins. Where the bins occur depends upon the distribution of the values in the input image.

Consequently, two adjacent 16 bit images will not have the same binning structure and therefore their brightness and contrast will be different. Unfortunately, these differences will be very apparent when displaying these images side by side.

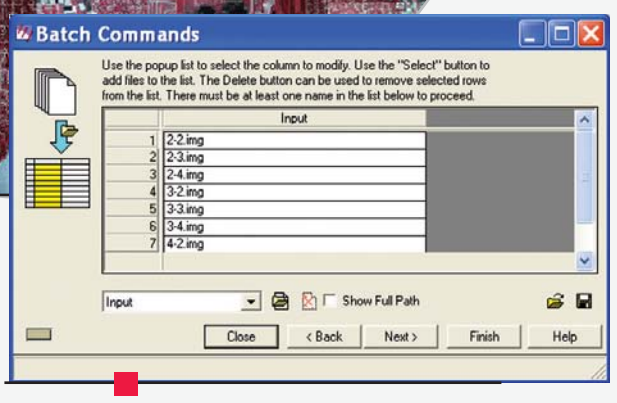
A solution for this is to mosaic the two images together. Then a single LUT can be used for this image mosaic.

10 steps to reproject many images in ERDAS IMAGINE:

1. From the ERDAS IMAGINE pane, click the **Data Prep** icon and Select the **Reproject Images** button
2. In the dialog box that appears specify one of the images you want to reproject as the **Input**
3. Enter a name for the **Output** image and select the desired projection.
4. Click the **Batch** button from the Reproject Images dialog
5. From the Batch Commands dialog select the **Modify commands automatically** option and then click **Next**
6. Click **Next** once more
7. Click on the **Select Files to Add** icon and add the remaining images to reproject to the input list
8. Verify all the images to reproject are listed and then click **Next**
9. Select the **Start Processing Now** option or chose a time for the process to begin
10. Click the **Finish** button



Differences in contrast across an image mosaic can be avoided by using a common Look Up Table (LUT).



Batching jobs in ERDAS IMAGINE® is made easy with the batch processing wizard.

Did You Know

Visual Learning Systems' (VLS) Feature Analyst for ERDAS IMAGINE® lets you extract object-specific features such as buildings, roads and tanks

analyze

Achieving Accuracy & Improved Decision Making with Imagery

Most organizations have vector databases; why should they incorporate an image database, as well?

Today's projects require more comprehensive and accurate information to facilitate proper planning and allocation of resources, leading to improved efficiency and cost effectiveness. Often vector databases are comprised of old, over-simplified or inaccurate information that could lead to bad decision making. By updating GIS data with images, organizations will benefit from the additional, more current information contained in images, which can improve accuracy and facilitate intelligent decisions.

Current & Comprehensive Information

Geographic changes in the real world are occurring more quickly than ever before, rendering most existing data sets obsolete, or at least outdated. Outdated or overly simplified information stored in vector databases can lead to inaccurate assumptions about the area being studied. These incorrect assumptions regarding anything from animal habitat, vegetation or utilities, to land use or development can lead to project delays, unexpected expenditures or possibly even project failure. In many cases, the use of up-to-date imagery may ensure that many of these obstacles to good decision making are avoided.

Imagery offers a wealth of valuable information that vector data cannot provide. Vector databases are built with explicitly selected features; for instance, roads, parks, and key places of interest represented by points, lines and polygons. Much essential contextual information, such as land use and quality, building dimensions and purpose, traffic snapshots and other details about human and nature's interactions with the area are not readily available in vector data. By utilizing a more comprehensive data set, namely imagery, GIS professionals and project managers can better understand elements that, while not directly involved in a project, may impact its success.

Accuracy

In addition to more comprehensive information, imagery can offer geographic accuracy advantages over outdated vector data. Newly captured images must undergo a rigorous referencing regimen, much more than what was required of older map resources. Often, maps created from vector information are highly inaccurate, when compared with images. Any number of factors may contribute to this, including faulty referencing, erroneous surveys, or simply that the maps are out of date. Projects planned based upon this flawed information could have potentially disastrous results.

Utilizing Geographic Imagery

Imagery can be intimidating, or it is written off as too costly, requiring too many resources, or as simply containing too much information. However, when exposed to the value of the data presented in images, users quickly understand the benefits.

The expense of imagery is far less now than in the past, and certainly less than the cost of halting a project planned with inadequate data. Black and white or color satellite images of the project area may be readily available from commercial sources. Additionally, organizations may acquire custom aerial photographs such as those taken by the Leica RC30 Aerial Camera, digital aerial images from the Leica ADS40 Airborne Digital Sensor, and topographical images from the Leica ALS50 Airborne Laser Scanner. Mounted on helicopters or light aircraft that fly a specific route over the terrain under study, these image-sensing systems can provide custom imagery to meet any organization's needs.

Increasingly, organizations are electing to acquire digital imagery which streamlines workflow by removing the requirement of film processing and scanning, resulting in a nearly real-time turnaround. As imaging technology has improved, resolution has become much higher. This leads to very large raw file sizes, but computer processing power has increased accordingly, and can often easily accommodate the image files. Also, the imagery can be saved in a high compression JPEG2000 format, which greatly reduces file size while retaining resolution.

Once an organization has captured its new geographic images — which may be in a variety of formats, such as JPEG, TIFF, MrSID or ERDAS IMAGINE® — information must be extracted. Using GIS image processing tools such as Leica Photogrammetry Suite or ERDAS IMAGINE from Leica Geosystems, users at all skill levels are empowered to seamlessly reference, measure, analyze and present both raster and vector images. Users may employ modeling, feature isolation and extraction, change detection algorithms, probability scenarios or other tools to understand the processes and activities taking place in the project area. After analysis is complete, and conclusions have been drawn, users have a variety of output options from which the information extracted can be visualized, shared, stored and presented. Depending on the project, this may be a hardcopy map, a 3D fly-through or a complex geographic database for reference throughout the planning process.

By utilizing up-to-date geographic imagery and tools, organizations are empowered with better quality information which improves accuracy and decision making in project planning. Better decisions can make a project run more efficiently and cost-effectively, and greatly contribute to overall success.

Did You Know

IMAGINE Radar Interpreter™ provides the fundamental tools needed to process and enhance SAR images

Leica Geosystems GIS & Mapping Powers Geospatial Imaging at U.S. Forest Service

USDA Forest Service has signed a blanket purchase agreement (BPA) for Leica Geosystems software. The Forest Service is standardizing on Leica Geosystems imaging processing and photogrammetry software, joining a growing roster of organizations that recognize Leica Geosystems as the premier provider of geospatial imaging solutions.

Through this agreement, the Forest Service will employ the full complement of Leica software products, including ERDAS IMAGINE®, Leica Photogrammetry Suite, IMAGINE Virtual GIS®, Image Analysis™ for ArcGIS, and Stereo Analyst® for ArcGIS. The software will be utilized by Forest Service field units in nearly every forest management application, including forest planning, inventory, resource mapping, fire monitoring and management, and forest restoration.

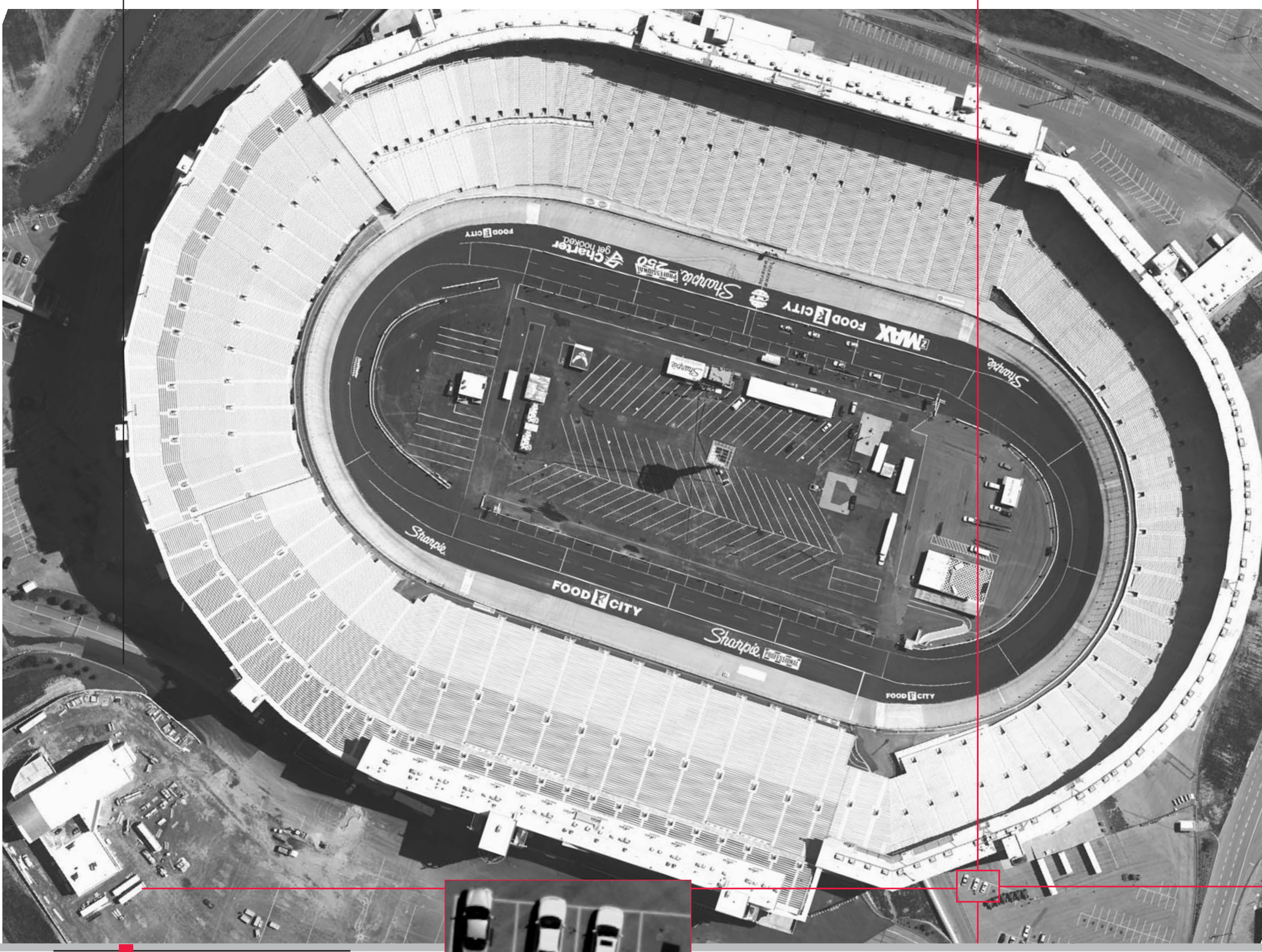
"The USDA Forest Service is pleased to continue its long relationship with Leica Geosystems through this new five year BPA contract for image processing software. The field units will benefit greatly from the expanded availability of Leica Geosystems products and number of licenses," said Michael Morrison, program leader for the USDA Forest Service Image Processing Software System.

Richard McKay, vice president of sales for Leica Geosystems GIS & Mapping, sees the agreement as a powerful demonstration of the company's ability to provide comprehensive hardware and software solutions to facilitate the geographic imaging process.

"We are delighted to expand our relationship with the Forest Service," said McKay. "This BPA is the largest single commercial software order we have fulfilled. It is a tremendous vote of confidence in Leica Geosystems software, and this builds our momentum as the preferred provider of solutions for every link of the Geospatial Imaging Chain."

Forestry applications make extensive use of false color imagery.

Featured Images



5cm **spatial resolution from the industry's #1 airborne digital sensor, the Leica ADS40 Airborne Digital Sensor.**

present

Show off your imagery!

Do you have outstanding images acquired with a Leica Geosystems GIS & Mapping airborne sensor, scanner or camera? We are looking for striking imagery to showcase.

Submit your key images, along with an overview of the project and your entry could be the featured imagery in an upcoming issue of **the link**.

Each issue will include a poster showcasing featured images that highlight the capabilities of Leica products. The black and white image above shows the Bristol Motor Speedway in Bristol, Tennessee, USA; it was taken by the ADS40.

You've done great work – share it with your colleagues! To enter your images or for more information, please contact Sara Upchurch at +1 404 248 9000 x2336 or sara.upchurch@gis.leica-geosystems.com.

SEND IN YOUR IMAGES TODAY!

False color ADS40 image of coastal habitat near Corpus Christi, TX.

Color ADS40 image of part of Austin, TX.

Calendar of Events

Date	Event	Location
February		
13–16	GeoTec Event 2005 www.geoplace.com/gt	Vancouver, British Columbia, Canada
12–15	ESRI International Business Partner Conference www.esri.com	Palm Springs, California USA
March		
3–11	ASPRS Annual 2005 Conference www.asprs.org	Baltimore, Maryland USA
April		
5–9	Association of American Geographers (AAG) Annual Meeting and Exposition www.aag.org	Denver, Colorado USA
16–21	FIG Working Week 2005 and GSDI www.fig.net/cairo/	Cairo, Egypt
25–26	LIDAR Mapping Forum 2005 www.lidarmap.org	New Orleans, Louisiana USA
26–28	ITEC 2005 www.itec.co.uk	Amsterdam, The Netherlands
June		
13–19	46th Paris Air Show www.paris-air-show.com	Le Bourget, Paris, France
July		
25–29	ESRI International User Conference www.esri.com	San Diego, California USA
October		
23–27	16th Pecora Remote Sensing Symposium www.asprs.org	Sioux Falls, South Dakota USA

Upcoming Training Schedule

Register online at gis.leica-geosystems.com/education

January		
10 – 12	Fundamentals of ERDAS IMAGINE® I	Denver, CO & Atlanta, GA
13 – 14	Fundamentals of ERDAS IMAGINE II	Denver, CO & Atlanta, GA
17 – 19	Fundamentals of ERDAS IMAGINE I	Washington, DC
17 – 19	Intro to Leica Photogrammetery Suite	Atlanta, GA
20 – 21	Fundamentals of ERDAS IMAGINE II	Washington, DC
20 – 21	IMAGINE VirtualGIS®	Atlanta, GA
24 – Feb 4	Geospatial Analysis for Defense	Washington, DC
February		
7 – 8	Multispectral Classification	Atlanta, GA
9 – 10	Spatial Modeler and Expert Systems	Atlanta, GA
14 – 15	Using Imagery to Update Your GIS	Atlanta, GA
14 – 16	Intro to Leica Photogrammetery Suite	Washington, DC
16 – 17	Spatial Modeler and Expert Systems	Atlanta, GA
17	Using Stereo Analyst®	Washington, DC
18	Cartography with Map Composer	Washington, DC
22 – 24	Intro to Leica Photogrammetery Suite	Denver, CO
25	Using Stereo Analyst	Denver, CO
March		
Feb. 30 – 1	Using Imagery to Update Your GIS	Denver, CO
2 – 3	Spatial Modeler and Expert Systems	Denver, CO
4	Cartography with Map Composer	Denver, CO
7 – 8	Multispectral Classification	Washington, DC
9 – 10	Spatial Modeler and Expert Classifier	Washington, DC
14 – 25	Geospatial Analysis for Defense	Atlanta, GA
21 – 23	Fundamentals of ERDAS IMAGINE I	Denver, CO
21 – 22	Using Imagery to Update Your GIS	Washington, DC
23 – 24	Spatial Modeler and Expert Systems	Washington, DC
24 – 25	IMAGINE VirtualGIS	Denver, CO
25	Cartography with Map Composer	Washington, DC
28 – 30	Fundamentals of ERDAS IMAGINE I	Washington, DC
31 – April 1	IMAGINE VirtualGIS	Washington, DC

Contact Us

For more information about Leica Geosystems GIS & Mapping and its products, please call +1 404 248 9000 or +1 877 463 7327, email info@gis.leica-geosystems.com or visit gis.leica-geosystems.com.

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