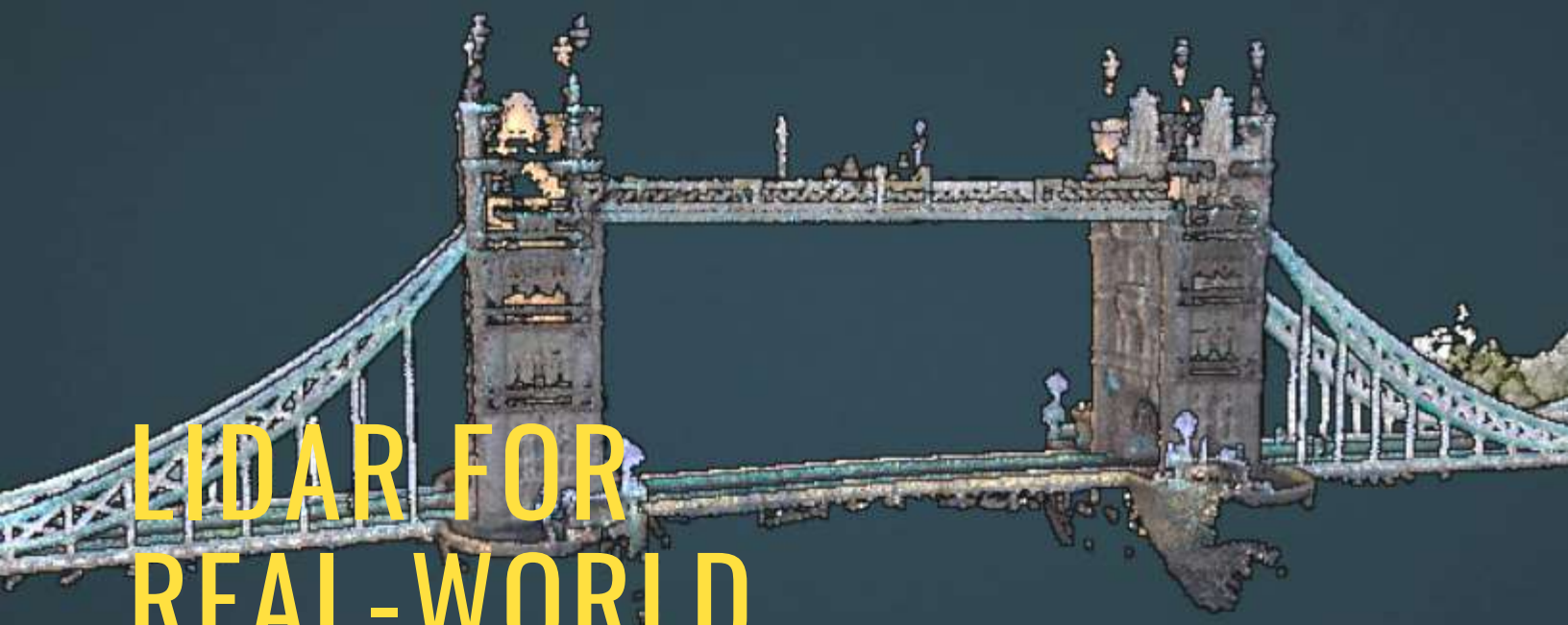
ISSUE 2 | JUNE 2022
Not for Sale | Only for Subscriber
ISSN: 2581- 4613

GIS RESOURCES



LIDAR FOR REAL-WORLD 3D MODELLING APPLICATIONS

EXCLUSIVE INTERVIEW!

Ashish Airon
Director
Pixel Vision

Image created using GeoSLAM Sample Data

Scan to visit website

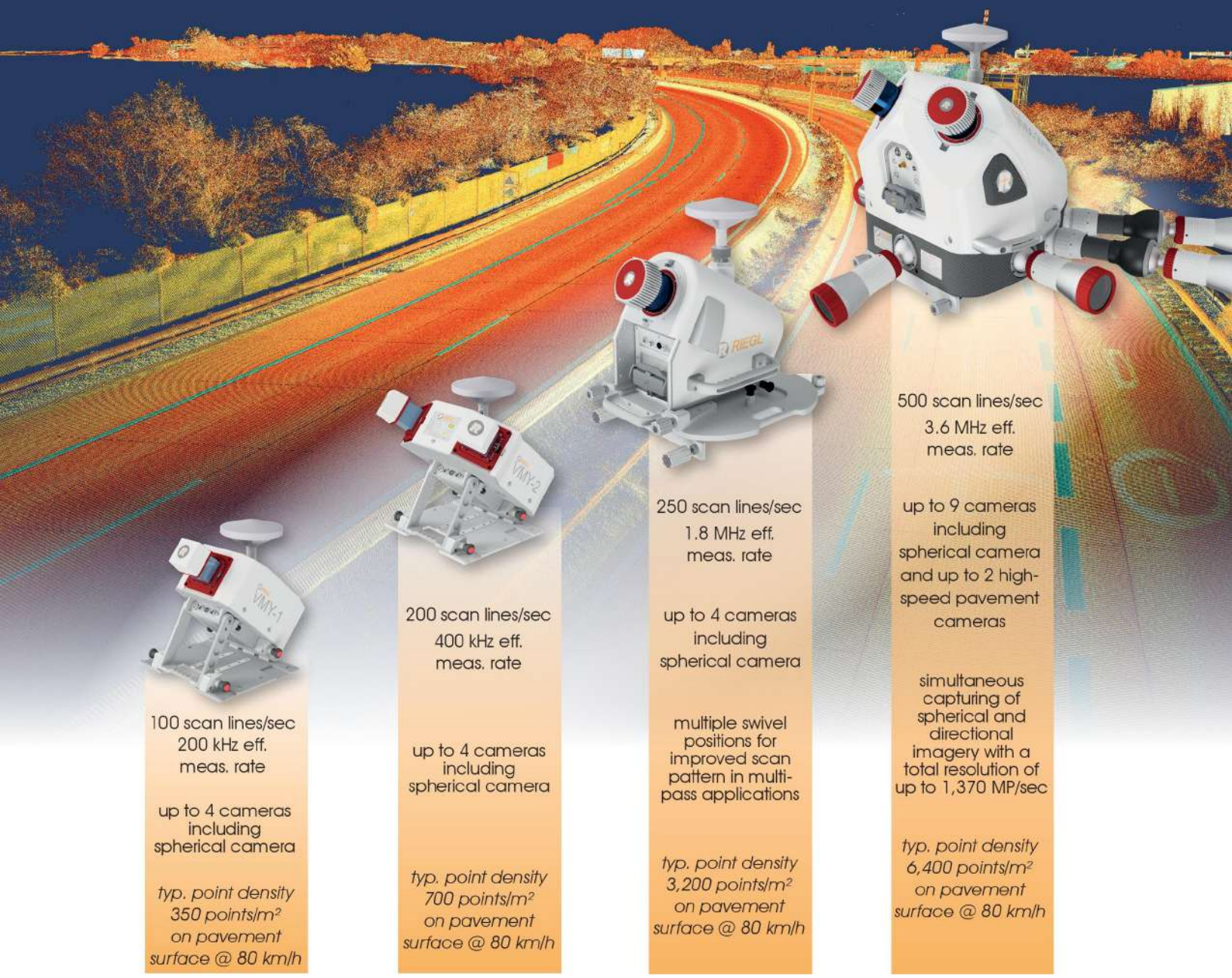
Behind the Scenes: Creating a Handheld LiDAR and PhotogrammeTry Toolkit

How YellowScan LiDAR System Contributed to Archeological Prospecting and Exceptional Heritage Management

Freeze It While It's Hot! Insights from a Fire and Explosions Visualisation Expert

RIEGL MOBILE MAPPING SYSTEMS

CHOOSE THE SYSTEM THAT PERFECTLY MEETS YOUR REQUIREMENTS TO SATISFY YOUR CLIENTS' TASKS!



VMY-1	VMY-2	VMQ-1HA	VMX-2HA
100 scan lines/sec 200 kHz eff. meas. rate	200 scan lines/sec 400 kHz eff. meas. rate	250 scan lines/sec 1.8 MHz eff. meas. rate	500 scan lines/sec 3.6 MHz eff. meas. rate
up to 4 cameras including spherical camera	up to 4 cameras including spherical camera	up to 4 cameras including spherical camera	up to 9 cameras including spherical camera and up to 2 high-speed pavement cameras
		multiple swivel positions for improved scan pattern in multi-pass applications	simultaneous capturing of spherical and directional imagery with a total resolution of up to 1,370 MP/sec
typ. point density 350 points/m² on pavement surface @ 80 km/h	*typ. point density 700 points/m² on pavement surface @ 80 km/h*	*typ. point density 3,200 points/m² on pavement surface @ 80 km/h*	*typ. point density 6,400 points/m² on pavement surface @ 80 km/h*

A broad system portfolio serving all levels of applications:
transportation infrastructure mapping, city modeling, GIS mapping & asset management, road surface management, open-pit mine surveying, rapid capture of construction sites and bulk material, HD mapping for autonomous vehicles

Explore the full portfolio of proven RIEGL LIDAR Sensors and Systems at www.riegl.com

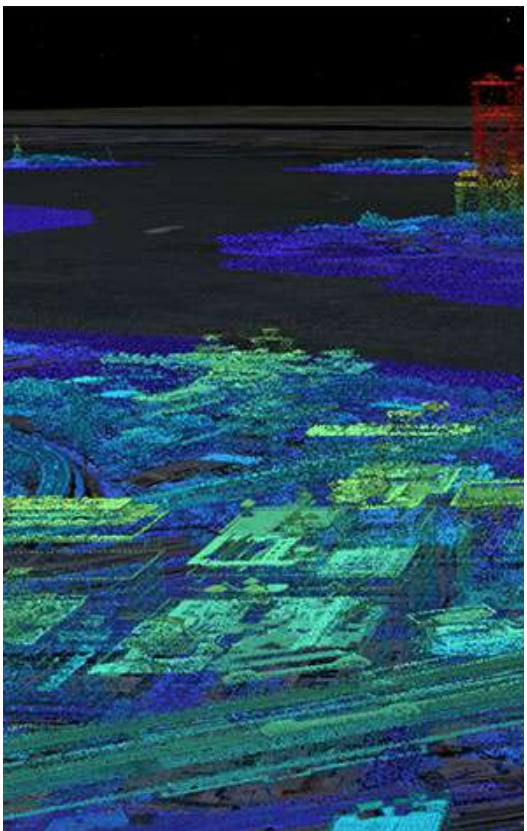
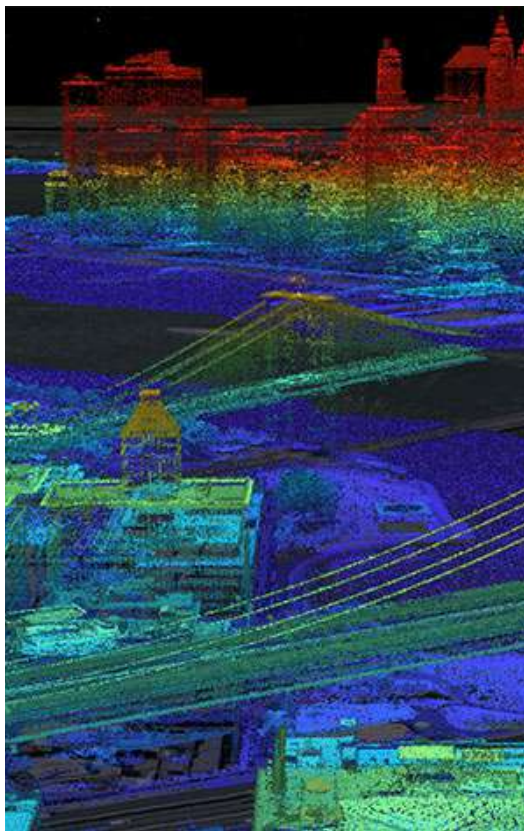
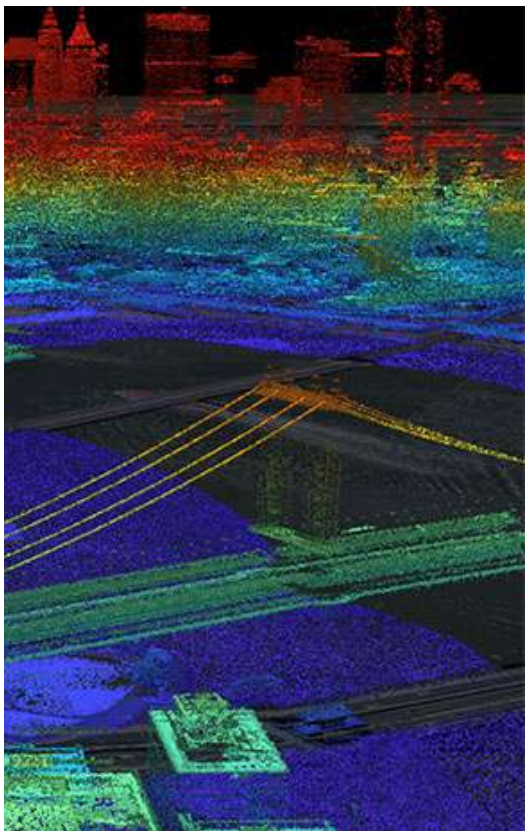
RIEGL®

Austria | USA | Japan | China | **RIEGL WORLDWIDE** | Australia | Canada | United Kingdom

Table of Contents

Columns

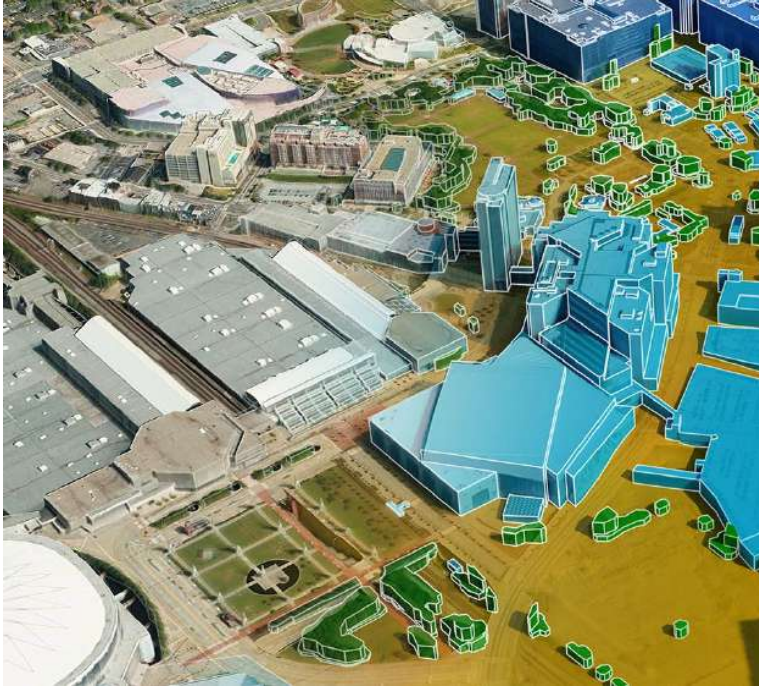
Articles

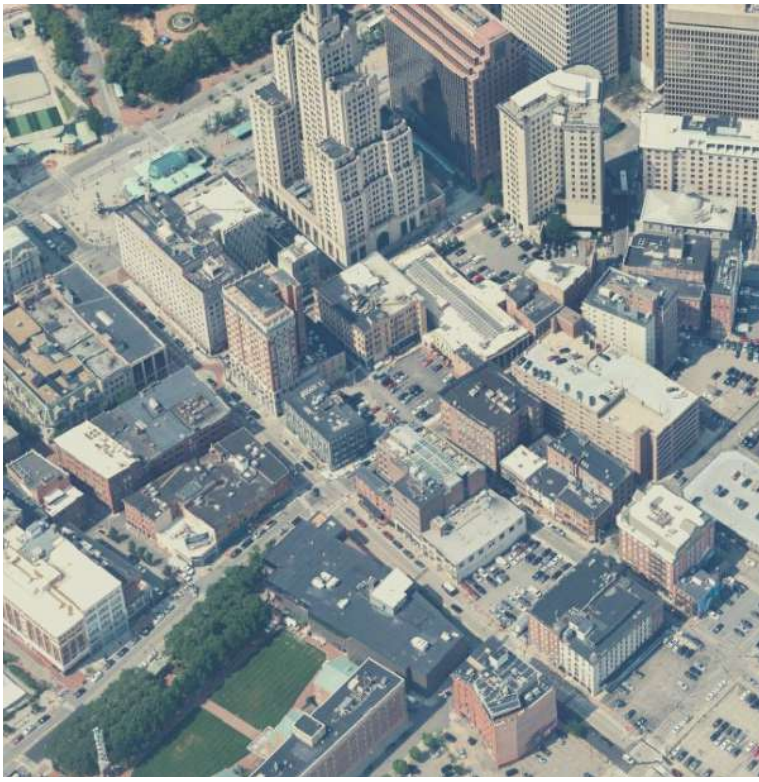




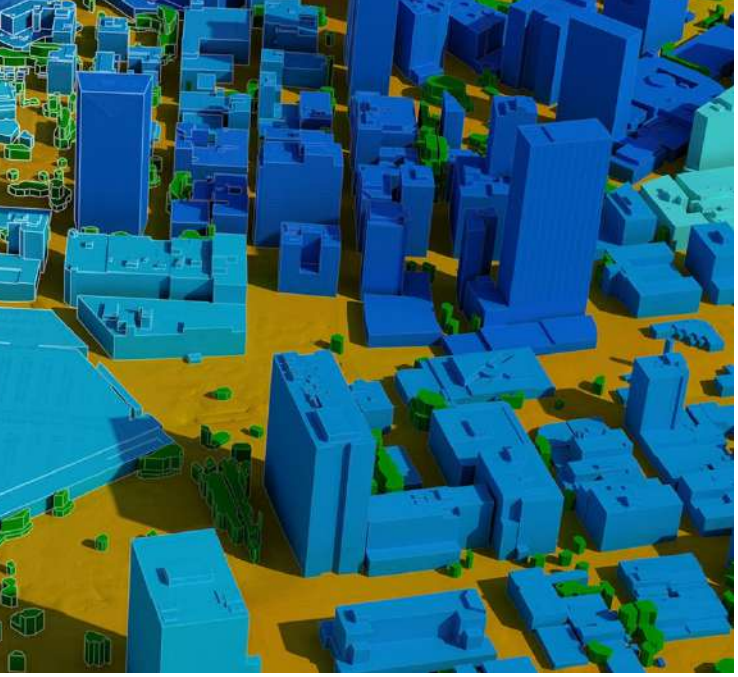
Executives

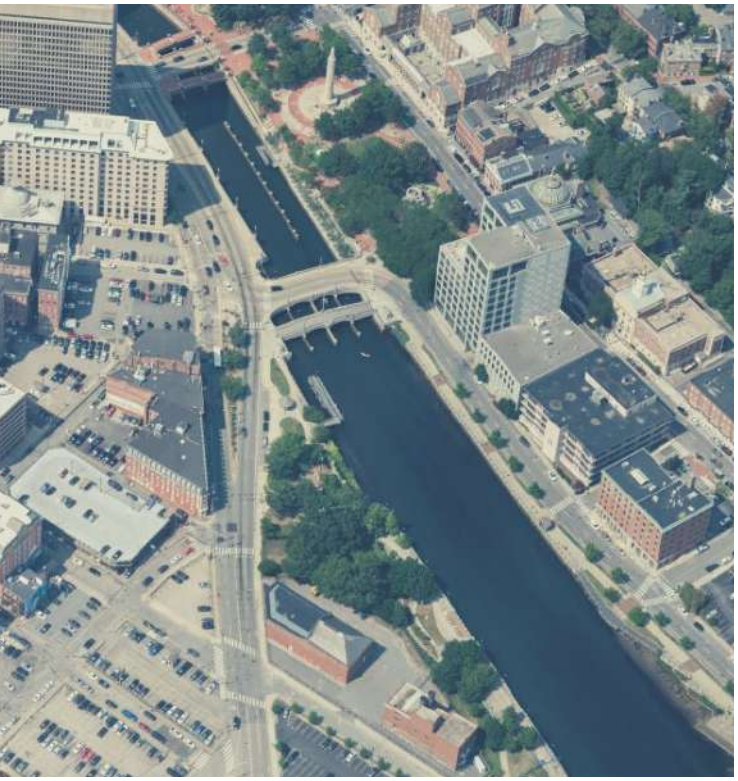
Regd. Office
GIS Resources
B-24, Jawahar Vihar, Malik Mau Aima,
Rae Bareli, Uttar Pradesh, India - 229010
Phone: +91 852 304 7671
Email: support@gisresources.com
Website: www.gisresources.com

Advertising and Marketing Queries
Email: support@gisresources.com









Editor's Note

By Ashok Prim

In an earlier editorial, I had stated that the LiDAR technology enables the capture of positions, both vertical and horizontal. A planner gets to visualize a terrain in its entirety, that is, in three dimensions. The enhanced visualization lets the planner imagine all potential scenarios for designing & implementing the project.

In any new infrastructure development project, an understanding of the layout of the terrain is extremely important for exploiting the full potential of the terrain. The impact of the surrounding terrain on the project, and vice versa, can also be envisioned when a holistic visualization of the 3D terrain model of the site and its surrounding is available to the planner.

The capabilities of this technology can be truly appreciated when redevelopment of a site is taken up. The smart city project of the Govt. of India is one such project, where, in certain areas of a city, redevelopment is taken up to provide more amenities and facilities to citizens. Here a real-world LiDAR 3D model of the site and its surroundings is vital for the planner. Combined with GIS, multiple decision-making scenarios can be arrived at before finalizing the design of the project.

LiDAR is a robust, versatile, and efficient Geospatial Technology that finds applications in increasing areas. It provides quick and accurate data for the planner and decision-maker to work with. Combined with other Geospatial Technologies it provides reliable 3D real word modeling possibilities and applications.

Château de Montségur is a former fortress near Montségur, a commune in the Ariège department in southern France © L'Avion Jaune

How a YellowScan LiDAR System Contributed to Archeological Prospecting and Exceptional Heritage Management

By Geoffrey Riggs
Communications Advisor
YellowScan

The Association Mission Patrimoine Mondial (AMPM) is an organization created to manage the process for the city of Carcassonne (South of France) and its Sentinel mountain castles better known as "Les Châteaux Cathares", successfully obtain UNESCO World Heritage certification. Built-in the 13th century, the combined site is an exceptional example of military architecture and construction from the time. As a part of the certification process, they need to provide 3D models that can identify known archaeological remains and possibly detect new ones for future exploration and make sure they are all protected by UNESCO classification. L'Avion Jaune, YellowScan's sister organization, was mandated to fly the mission using the YellowScan Explorer LiDAR solution.

What is the Challenge?

The 7 fortified castles are spread out over 60 kilometers of mountainous terrain and not easily accessible by foot, so traditional archaeologic methods did not make sense for this phase of the project. A secondary objective of the project was to identify any new archaeological sites that were not previously identified and visible to the naked eye for further research as well as survey the primary 7 sites looking for ruins yet to be discovered.

Solution

Given the mountainous terrain and distance between the different castles, it was decided that a manned helicopter mission was the best profile to capture not only the photogrammetry resources for the sites but also the

point could data to render the 3D models. The team used the YellowScan Explorer, our first LiDAR solution that can be mounted on a light manned aircraft or helicopter as well as mounted on any professional UAV platform.

Our objective with Explorer, like all of our hardware platforms, is to offer the market a solution that strikes the right balance between size, range, accuracy, and weight. Combined with 1-year unlimited technical support and training, our users will be ready to take full advantage of Explorer's functionality and successfully complete their surveying projects.

Mission Parameters

- 7 Castles surveyed
- 5 days of flight
- 3 flights
- 200meters from the ground
- 80 points /m²
- Ground data under canopy Using light helicopter and YellowScan Explorer
- 30-35 m/s Flight speed

Figure 1: YellowScan Explorer Mounted on a Helicopter © L'Avion Jaune.

"Due to the difficult access and the density of the vegetation around the castles to be studied, airborne LiDAR was the only feasible option. The Explorer's long-range capability and size allowed us to easily integrate the solution on the helicopter and survey the 7 castles, which are geographically distant, more quickly than if we had had to do it with a drone. Given the Explorer's 5 echo capability it can easily penetrate the vegetation to recover the ground and generate the terrain profile, allowing the production of an accurate DTM thus giving the archaeologists a new set of mapping tools for their project."

Jane Benjamin Pradel - Pilot & Aerial Survey Project Manager, L'Avion JauneDoe

Figure 2: Photo of the Puilaurens Castle © L'Avion Jaune.

Results

In total, 3 helicopter flights were necessary to map the totality of the castles spread over the departments of Aude and Ariège, in the South of France. The data recovered in fact did detect possible reliefs and ruins suggesting undiscovered human activity which will serve as a guide for future archaeological excavations. The mission also justifies an extension of the original protection zone planned for these historic sites.

By commissioning the complete 3D modeling of the seven sentinel mountain castles, the AMPM has improved its understanding of the historical significance of the area and increased its chances of a a successful outcome for its UNESCO World Heritage application.

Key Benefits of YellowScan Explorer

- YellowScan's longest-range scanner (600m)
- Single solution for multi-platform usability
- Applanix APX-20 IMU
- Can switch between 100 -500 kHC PRFPRF depending on mounted vehicle
- 165Hz scanning frequency

Please get in touch for help with selecting a LiDAR solution for your needs – our expert team can propose a proof of concept for your unique requirements.

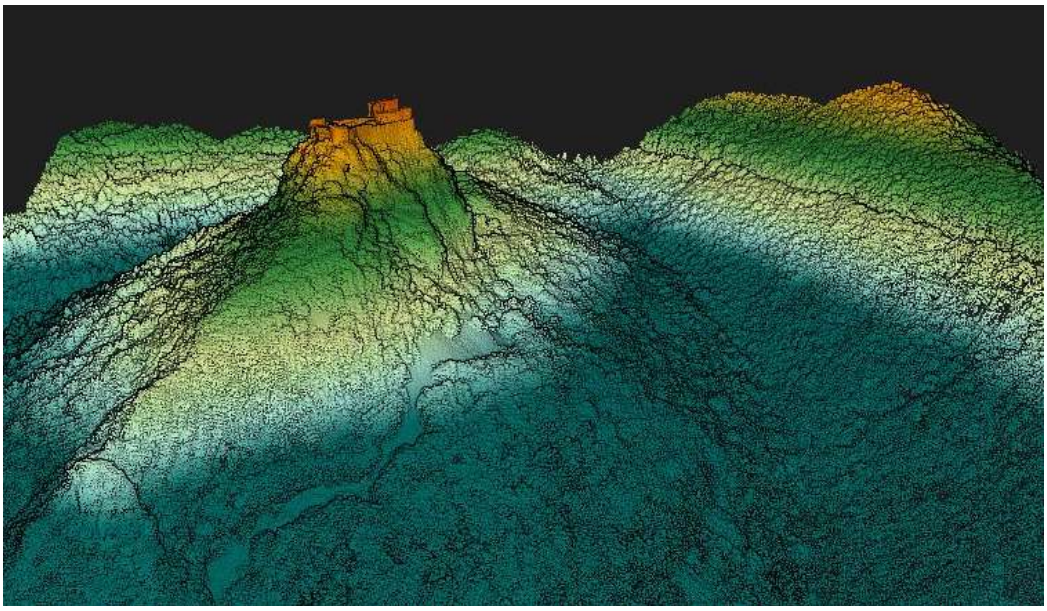


Figure 3: LiDAR Point Cloud of the Puilaurens Castle © L'Avion Jaune.

Figure 4: LiDAR Point Cloud of the Puilaurens Castle © L'Avion Jaune.

Freeze It While It's Hot! Insights from a Fire and Explosions Visualisation Expert

Jason Mellström
Business Development Manager
Nordics - Public Safety & Forensics
Leica Geosystems

Forensic photographer, and crime and fire scene visualisation expert, Jason Mellström shares his passion for the unique technical and procedural challenges of fire scene investigations.

Born into a family of photographers, Jason Mellström has a passion for the perfect image in his DNA. "But normal photography quickly hits its limits on a crime or fire scene because everything is black. So how do you get a meaningful image?" That's the question that Jason was asking at the National Forensics Centre in Sweden when he began contributing to the development of 3D technology for forensic documentation.

"When I first got my hands on the Leica RT360 technology package, it reminded me of getting my first EOS digital camera and Photoshop; a whole new world opened to me. Suddenly I could work seamlessly and tell visual stories in completely new ways. The RT360 laser scanner is a similar thrilling discovery. It allows you to combine point cloud data and photographic images and other data to visualise and reconstruct the stories of fires or explosions and then share them with stakeholders in a seamless workflow" explains Jason.

Carbon Clues

"In fire and explosion investigations we have a variety of clues. For example, which side of a doorpost is burnt darker? That tells you which direction the fire was going.

Or what color is the melted metal? That tells you the fire temperature. There are also phenomena like heat shielding or debris patterns that contain important information. During fires you often get things collapsing and during explosions, there are a lot of scattered parts. Often these objects are blocking access to crucial evidence that the investigator needs to examine. And they are carbonized, meaning they break when you touch or tread on them. That is why you need to be very careful in the way you approach the scene." explains the veteran investigator.

"To secure the vulnerable evidence, you need to freeze the location as soon as possible after the fire – while it is still 'hot'. The goal is to preserve the scene as accurately as possible during the first walk-through in a Forensic Digital Twin. This is a 3D real-time virtual representation of a physical location. Once you have captured the scene data in this way, you can start shifting things to see what's behind or underneath. Leica Geosystems' fire investigation solutions are a response to all these challenges," says Jason Mellström with conviction.

Comprehensive Data with No Compromises

Firstly, with the RTC360, you can work quickly without having to compromise on resolution. You can document and visualise the location with high-quality 3D scans at a rate of up to 2 million points per second. That allows you to capture 3D color point clouds in under 2 minutes. Secondly, it is comprehensive: the field of view is a generous 360° horizontal and 300° vertical field and you can attach additional information like images, text, or geodata to the scans. Thirdly, you don't have to worry about the light: you can scan in pitch darkness and still get accurate results as the RTC360's Class 1 laser works with 1550 nm light that is invisible to the human eye.

For field operations, a light, compact and robust system is also a very important factor. The RTC60 is IP54 rated for dust and water protection and can be paired with a dedicated lightweight tripod to offer a highly portable and versatile system. A single user can carry it from setup to setup and access tight spots as needed – all day long and without fatigue. This is a huge advantage because the fewer people are involved, the easier it is to avoid disturbing the fragile post-fire scene evidence.

During the rescue or cleanup phases, response team safety is also an important topic. But Leica has that covered too. The fire brigade can monitor the structural stability of the burnt building using a Leica Total Station. If the structure starts to move, the device gives visual feedback right away and sounds an alarm. This allows the commander to order an immediate evacuation before anyone gets hurt.

All these features allow investigators to work effectively and leave the site confident that they have all the necessary data. After all, for most fire or explosion investigations, returning to the site just because someone missed an important piece of evidence is not an option.

Seamless Sharing With Stakeholders

All fire investigations start with the work of the fire brigade. If someone was hurt or there is a suspicion of arson or fraud, then the police get involved. Otherwise, it is usually private investigators working on behalf of insurance companies.

For example, the investigation could be about looking at the remains to see if the value of the claim is plausible. Or it could be about finding the origin of the fire to determine if negligence or an accident was the reason for the fire.

The best way to expedite the investigation is if the investigators have a seamless 3D documentation and visualisation solution. Then you can create a Forensic Digital Twin and allow all the stakeholders to immersively explore an immutable record of the original scene. Ultimately it helps them to make solid, informed decisions.

"Being involved in the development and sharing of new technologies with the Public Safety community and customers around the world really motivates me" explains Jason who now works for Leica Geosystems as a forensic and visualisation expert.

"The technological development over the past few years has made laser scanners faster, more accurate, and easier to use, making scanning data acquisition in the field more efficient and more fun than ever before. The RTC360 offers a combination of hi-precision, accuracy, and robust reliability under a wide variety of conditions. There is nothing like it."

Figure 1: Leica RTC360 Laser Scanner.

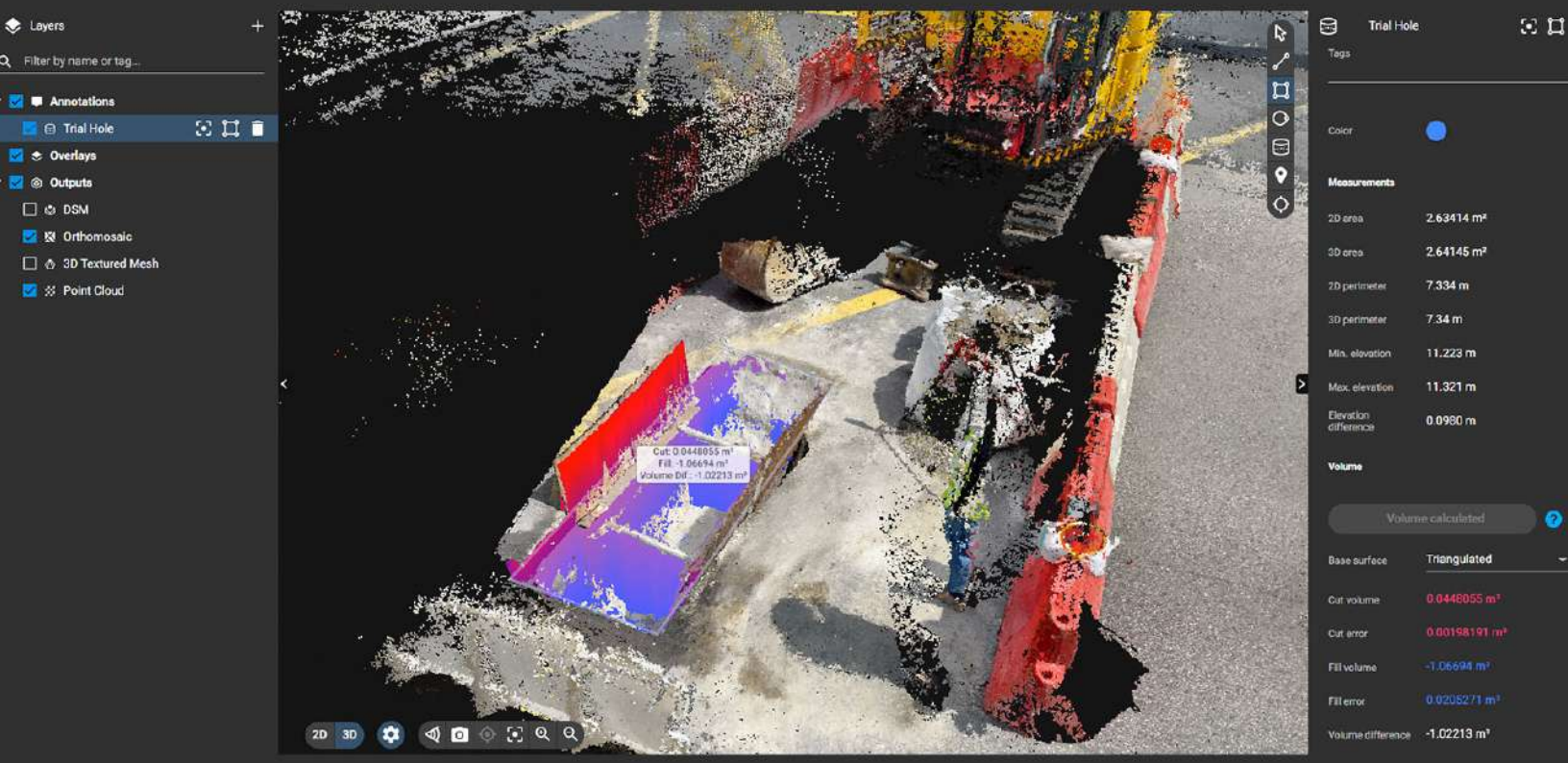
3 Good Reasons to Choose the Leica RT360 Laser Scanner for Fire and Explosion Investigation

IMMERSIVE - The Forensic Digital Twin created on a fire scene allows investigating parties to do as many virtual site walk-throughs as they want, looking at the scene and evidence from different angles.

DECISIVE - The resolution of a Digital Forensic Twin data created by the Leica RT360 laser scanner allows the investigator to capture and retain important information about of the scene that can be important in reconstructing the story of the fire decisively.

PROTECTIVE - Leica Geosystems fire and explosion investigation technology can also be used to monitor structural stability during the rescue, inspection, or clear-up phases thus protecting lives.

Figure 2: Digital Forensic Twin Data Created by the Leica RT360 Laser Scanner.



The trial holes can be measured on PIX4Dcloud as an accurate construction record.

Behind the Scenes: Creating a Handheld LiDAR and Photogrammetry Toolkit

By Eloise McMinn Mitchell
Writer and Content Manager
Pix4D

In an age where technology constantly changes every few years, LiDAR is continuing to increase in popularity and use. This practice of measuring distances with light beams were not very successful with early attempts in the 1930s. Now, LiDAR technology is being added to everyday devices like phones and tablets, which is revolutionizing how it is used. No longer is it only available to a select few who can afford expensive equipment, but instead LiDAR is on the verge of becoming a standardized tool.

LiDAR is especially popular in construction and surveying. It can be used to check if a surface is a level or measure distances. There is a trade-off between expense and accuracy that LiDAR users must balance. Some surveyors turn to photogrammetry instead, which is the process of measuring from images. Either technique has its own advantages and disadvantages, or Pix4D offers a solution that incorporates both.

In 2019, there were rumors that new smartphones would include LiDAR sensors. One developer at Pix4D wanted to create an app that would use a LiDAR sensor and existing Pix4D technology. They designed PIX4Dcatch: an application that gathers datasets made up of both images and LiDAR data. The datasets can then be automatically uploaded to PIX4Dcloud, the online photogrammetry platform, or transferred to PIX4Dmatic, desktop processing software, to create accurate 3D models. PIX4Dmatic then gives users the option to

choose between photogrammetry, LiDAR, and fused point clouds to take advantage of all the available information.

PIX4Dcatch was enhanced by Pix4D's partnership with vigram, a German manufacturer that invented the viDoc RTK rover. The viDoc is a portable case with an RTK antenna that connects to recent iPhones or iPads. With it, photos captured by PIX4Dcatch are geotagged with centimeter accuracy. The viDoc was launched in 2021 and is already available in many countries. It has a relatively low price point compared to standard RTK devices or LiDAR scanners. It is easy to transport and can be deployed in minutes - which makes it especially useful for sites with tight deadlines that need a rapid turnaround.It is a game-changing tool for site surveying in construction - data collection is done just by walking around a site holding the device, which can be transported in a pocket or backpack. The results are uploaded to the cloud and shared online, or exported to a desktop. The final 3D models can be measured, annotated, and sent to contractors or project stakeholders. PIX4Dcatch and viDoc provide the best of both worlds: high accuracy with photogrammetric and LiDAR point clouds.

The Real-World Applications of a Joint Photogrammetry and LiDAR Workflow

HSC Pipeline Engineering Pte Ltd is a company based in Singapore that works across the country on complex construction projects. This includes laying pipelines in the heart of the city. There are many challenges for pipeline projects - urban areas have lots of pressure on minimizing disruption to the area whilst having a high demand for maintenance or modern infrastructure installations. Roadworks around pipelaying can cause traffic, which in turn creates more air pollution, expenses, and a domino effect of challenges. For HSC, this means they need to maximize site efficiency whilst maintaining their accuracy and quality of work.

The permits required for laying pipelines in Singapore are complicated, and there are strict aerial regulations, meaning drones aren't a feasible tool - nor are they appropriate for pipelaying. The process requires marking out a site, excavating, laying pipes, and re-filling the dig as fast as possible. HSC wanted to use the viDoc and PIX4Dcatch to capture trench excavations before and after pipelaying to record everything that happened and use that as part of long-term records.

HSC learned about the solution from Pix4D's reseller in Singapore, Easepect, who demonstrated the viDoc and its capabilities. After seeing the potential changes it could make to their work, HSC wanted to test the viDoc RTK rover for a piping project in Singapore. They had 2 key aims for adding it to their workflows:

Figure 1: Easepect and HSC worked together to apply the best workflows for PIX4Dcatch and viDoc to boost productivity.

Figure 2: HSC and Easepect have seen rapid success in working with the viDoc RTK rover.

Figure 3: The viDoc RTK rover is saving time and improving construction workflows, boosting productivity for HSC Pipeline Engineering in Singapore.

- Digitally reproduce excavated trenches and present them to stakeholders for inspections, reviews, and further analysis
- Complete surveys more quickly with RTK accuracy and digital twins

HSC spends a lot of time and money on excavating trial holes, which are dug along pipelines. They can require 5 - 10 people to dig, measure, and backfill them. They're placed at 30-meter intervals along pipelines, creating multiple sites that are all potentially disrupting traffic if they are near roadways. As HSC lays upwards of 3,000 meters of pipes per month,

the operational commitment of trial holes alone reaches 67,200 hours of work per year and costs 1,800,000 USD.

So, HSC deployed the viDoc and PIX4Dcatch for trial hole excavations. The challenge of documenting these sites had always slowed down work, and HSC was keen to find a solution that could potentially save them time and money without compromising the accuracy of their records. After a trial hole was excavated, an engineer would activate viDoc and PIX4Dcatch for a site scan. They attached it to an iPhone 12 Pro Max and mounted the phone onto a surveying rod. The survey of a single trial hole took just 50 seconds to walk around it and capture all of the necessary data. During data collection, PIX4Dcatch uses the LiDAR feedback to create a 3D model on-screen that allows the engineer to see how complete their final 3D model will be, like a preview. This ensures that they do not miss any details during the site scan.

After the site scan with PIX4Dcatch and viDoc, the photos and RTK data are uploaded to PIX4Dcloud and processing starts straight away on the cloud platform. Once completed, the 3D model can be annotated and analyzed, including measuring volumes and distances, before being shared via a link. This means that people in Singapore and abroad can all see the outputs and progress of a project. The outputs can be sent to government officials or regulators to ensure HSC's practices match industry standards, as well as being used for internal records of the exact location of infrastructure and assets. These shareable results cut down on unnecessary site visits because of the accuracy and easy exploration of the digital twins.

The results? HSC has found that using PIX4Dcatch and viDoc has sped up surveying operations by as much as 30 - 50% for trial holes. This is boosting their overall pipelaying productivity by 5%, which is a significant scale-up in HSC's operational capabilities. "We have imagery, digital twins, and most importantly, actionable data available in record time for our internal and external stakeholders to use," says Foo Zhi Rui, Operations Development Executive at HSC.

The clear benefits of the viDoc, in this case, have boosted efficiency and brought accurate 3D models to HSC's sites that manual measurements and 2D photos could not deliver.

The Growing Success of Handheld LiDAR Solutions

PIX4Dcatch and the viDoc are being used by professionals worldwide. The viDoc has been licensed and launched in multiple countries and regions, including North America, the EU, Singapore, and most recently, Japan. It has a combined LiDAR and photogrammetry workflow that's never been done before - which can be seen to full effect by PIX4Dmatic producing dense, depth, or fused point clouds from LiDAR and photogrammetry data collected with PIX4Dcatch and the viDoc RTK rover.

For HSC, it solved the problem of making urban surveys faster without compromising the precision and transparency of their operations. It's a game-changing device. The addition of this workflow had immediate benefits for HSC which they're continuing to deploy to multiple sites.

"The combination of PIX4Dcatch, viDoc, and PIX4Dcloud has enabled us to create high-quality 3D scans that are geospatially accurate and easy to share with stakeholders. Not only is the workflow intuitive and seamless, but it is also at a fraction of the cost of other multi-part solutions available on the market." - Managing Director of HSC Pipeline Engineering Pte Ltd, Mr. Shane Shi.

As the viDoc continues to grow in popularity and availability, it will continue to change how site surveys and management work, whether specifically in construction or more widely in public works operations. It's the future of terrestrial site scans that is negating the use of cumbersome, expensive equipment, proposing a handheld solution that can move from site to site and be used by employees on-site with minimal training. As LiDAR grows in its popularity, this will be the tool that balances the benefits of LiDAR precision with accessible price points.

Evaluating seawalls in the Miami Beach, Florida.

How Miami Beach Digitized Seawall Using TrueView

By GeoCue Group Inc.
USA
www.geocue.com

Rising sea levels and high tides continue to make noticeable impacts to coastline communities and the environment. As a result, geospatial professionals and surveyors monitor affected areas. The overall goal is to accurately assess and prioritize solutions in the hopes of preventing future occurrences. With reports predicting the continuation of sea levels and high tides to rise, many cities bordering the coastline are concerned.

Seawalls are designed to prevent upland erosion and storm surge flooding. Coastline cities utilize seawall structures to help maintain these issues. Currently, Miami Beach, Florida has a total approximate length of 57 miles of seawalls. However, low-lying seawalls have contributed to many flooding events over the years.

In 2019, the City Commission of Miami Beach, Florida assigned the Department of Public Works to develop a strategy to monitor and encourage private property owners to reconstruct seawalls to address this ongoing issue.

Solution

In conjunction with the City of Miami Survey Department, GIS Manager, Nestor Navarro, researched different data collection methods, both internal and external (i.e., consultant-manned aerial/boat LiDAR) to conduct this project. After further analysis, the research presented that the outsourcing methods were too expensive and soon

realized drone collection would be the preferred method.

Photogrammetry vs Drone LiDAR

At first, Mr. Navarro considered conducting the project by drone photogrammetry using the DJI M200 partnered with GeoCue's Loki GNSS PPK Direct Geo-positioning System. However, he quickly noted that using drone LiDAR for this project would give them the following advantages:

- ability to penetrate vegetation
- ability to conduct flights regardless of the weather conditions
- post-processing times are much faster
- point cloud generation is much faster

Following careful consideration and research, the Department of Public Works decided to use the drone LiDAR collection method. By bringing this technology in-house, they were able to reduce cost, achieve the best quality, and avoid the need to access private properties.

True View 410 3DIS

Miami Beach, Florida invested in GeoCue's TrueView 410 3D Imaging System allowing the ability to collect LiDAR and photogrammetry in a single flight.

Project Scope

The team conducted a 57-mile drone LiDAR/imagery survey deploying their DJI M600 drone partnered with GeoCue's TrueView 410 3DIS. With the collected LiDAR and imagery data, they were able to digitize approximately 2,500 sea walls in GeoCue's EVO software and transferred elevation to each property presented in an ArcGIS database environment.

They were able to quickly generate colorized 3D point clouds, orthophotos, digital elevation models, digital terrain models, contours, elevation extractions, and more. These deliverables were compiled and transferred into a custom ArcGIS database environment. This database easily hosts and displays seawall elevations, jurisdictions, types, and owner — tied to control reports from TrueView capture.

With this data, the City of Miami Beach Public Works was able to present its newly developed database to the commission in September 2021 and make suggestions based on its analytic drone LiDAR data to prevent future flooding.

Figure 1: Miami Beach has approximately 55 miles of seawalls. About 50 miles are privately owned and the rest are owned by the city.

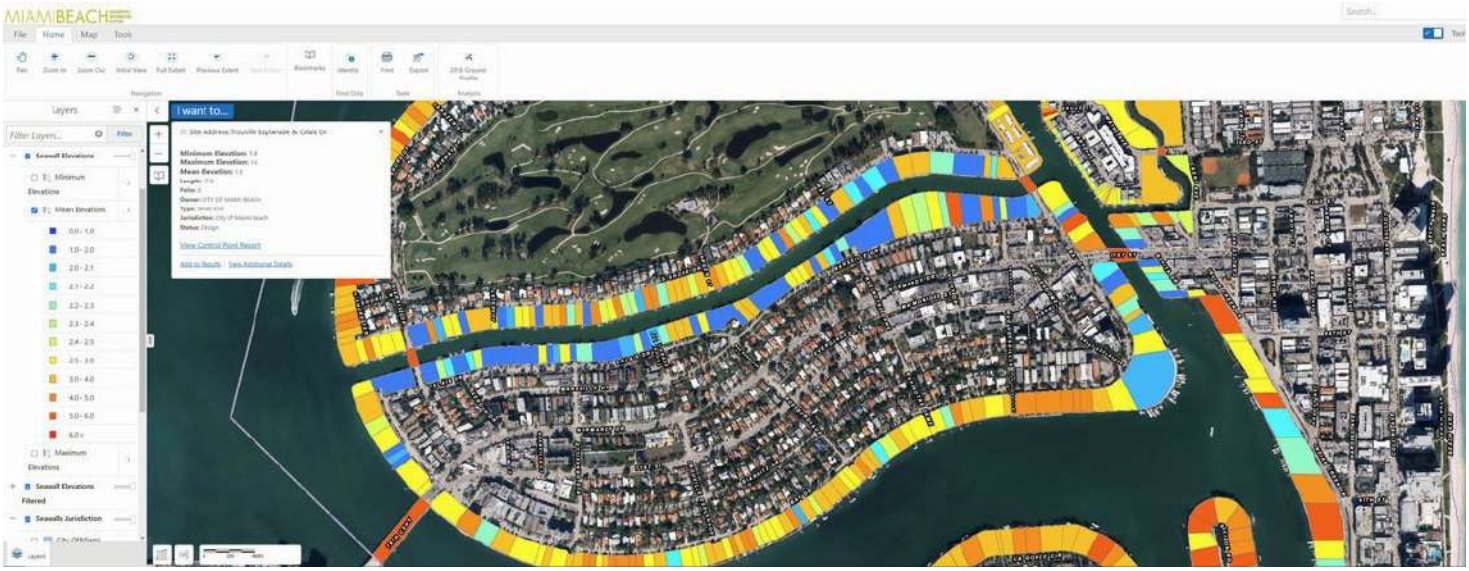


Figure 2: Miami Beach made data available on a GIS platform, which allowed the public to get a quick visual of the elevation of both public- and privately-owned seawalls in their neighborhoods and across the city.

How AI and Aerial Imagery Can Improve Damage Assessments in Agricultural Insurance

Corey Feduck
Director of Business Development
Ceres Imaging
USA

As extreme weather events continue to increase in frequency, insurance firms are partnering with agricultural technology companies to gain efficiency and accuracy in underwriting, fund designation, and claims assessments. By our latest count, at least six of the Approved Insurance Providers (AIPs) in the US have announced strategic partnerships with agricultural technology companies since 2019. As a data-heavy industry, technology adoption in insurance helps with efficient data transfer between customers and insurers, while also reducing risk.

One technological development for agricultural insurance has been the use of remote imaging for damage assessments. Geospatial tools such as satellite imagery are increasingly being used to reduce the time providers spend in-field, giving them data on a claim before they even reach the farm in question. Furthermore, there's an opportunity for AIPs to go beyond satellite technology by combining it with high-resolution aerial imagery coupled with insights powered by AI, bringing improved accuracy and speed to today's in-person damage assessment methods.

Accuracy

One key benefit that imagery insights can offer insurance providers in managing damage assessments is its precision. Accurate representations of planted and impacted acres caused by extreme events make it easier to prioritize and quantify risk. Sharing such data with growers

directly also support a more collaborative relationship, often saving the grower time from having to do the damage assessment manually themselves.

The accuracy of damage assessments is dependent on the technical specifications of the imagery data as well as the quality of the algorithms used to assess the damage. For example, Ceres Imaging acquires aerial imagery using a proprietary, 5-band multispectral plus RGB camera system at a sub-meter resolution. By combining this high-quality imagery with a neural network based on crop-specific training data, Ceres Imaging is able to separate soil and ground cover from crop canopy. This gives Ceres and its customers the ability to identify and quantify changes to crop health at the plant level, versus the pixelated raster images produced by satellite alone. Having accurate insights associated with the number of individual plants can help assessors improve on standalone in-field observation, by identifying which plants are most affected and thus where in-person assessments are needed, so the scale of the damage is more accurately quantified.

Timeliness

Quantifying damage quickly helps insurance providers reduce cost of assessments and build stronger relationships with their customers. As soon as crop damage has occurred, imaging coupled with AI can be used to identify and quantify the damaged crops down to the acre or even the plant level within days of a damage event. Furthermore, certain yield impacts like water stress caused by limited water application can be captured 2-3 weeks before it is visible to the naked eye (and often before the grower themselves know) using advanced thermal imaging from plane-based sensors.

Quickly quantifying the exact size and impact of a claim can help field teams manage their time and visits more effectively. For example, after a large-scale hail event, there may be situations where there are more claims than field team members available. Tools like remote imaging become critical to prioritize where field staff should go in these times. Field reps can view their complete portfolio on a mobile-optimized map and filter to view damaged fields according to crop type, length of customer relationship, or size of damage impact.

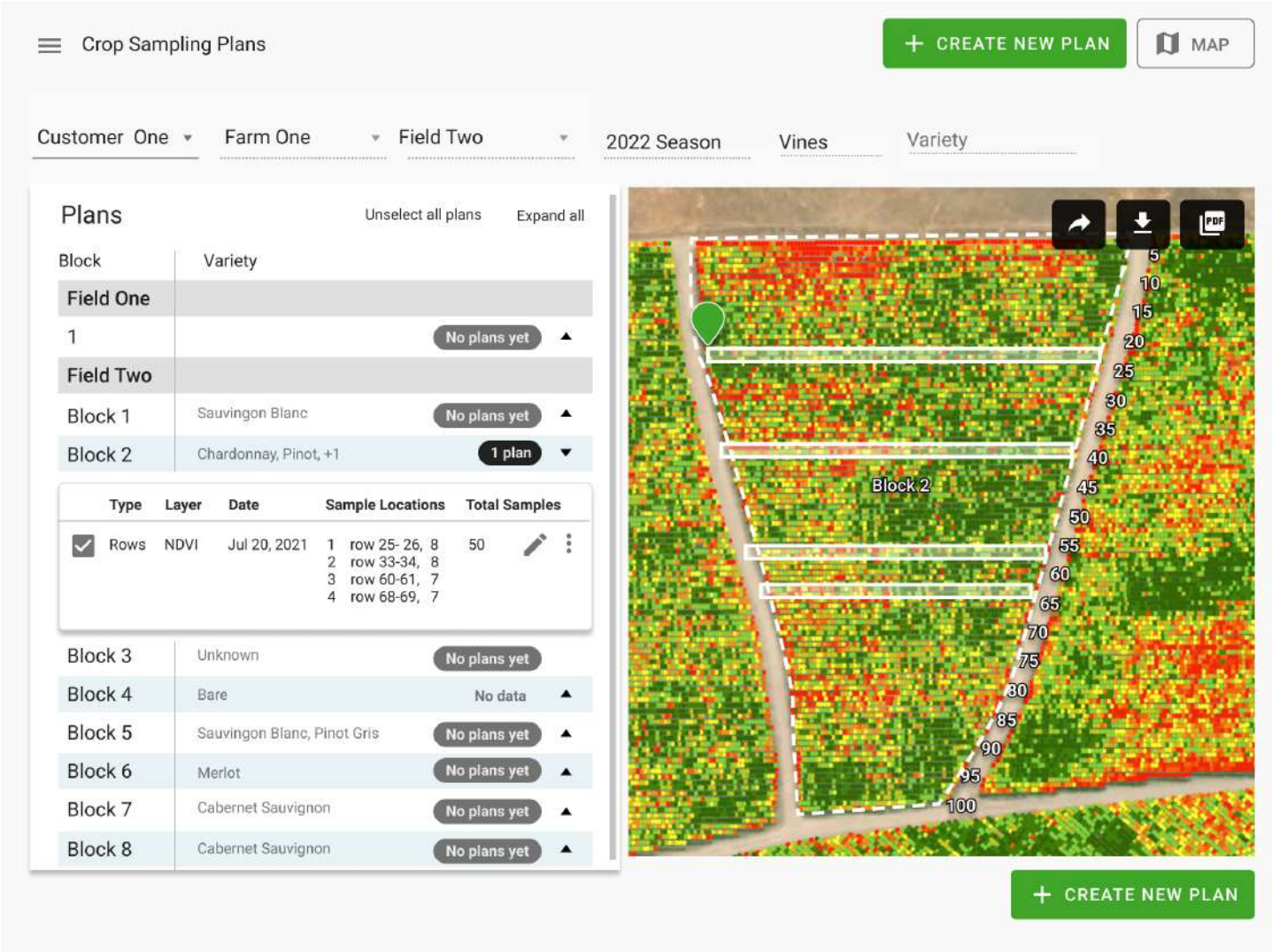


Figure 1: In this example, Ceres Imaging uses NDVI to measure the canopy of wine grapes and recommend a plan for in-person sampling that's more statistically representative of plant health across the field.

When out in the field, field reps can also use the GPS functionality to navigate to fields to be more efficient with their routes.

Choosing the right imaging platform to quickly assess damage events depends on the crop type and the type of event. Satellites are often a good first choice to filter damage assessments because of their relatively low cost. However, satellites alone often cannot provide the immediate turnaround for data that are needed by insurers after a damage event. Even satellites with a relatively short revisit time can be affected by confounding in-field or weather conditions, such as clouds, that can often lead to waiting times of two to three weeks. There's also an opportunity for providers to use both satellite and aerial imagery in tandem, making in-person visits more effective with quick and accurate data. For example, a sharp change in crop health could be detected by satellite imagery, thus triggering an aerial flight, which can usually be deployed within 24 hours.

Conclusion

By integrating imagery-based insights into their operations, insurance companies can increase customer satisfaction and reduce risk with accurate and timely analysis of damage assessments. It is unlikely that damage assessments will ever shift to entirely remote solutions like satellite or aerial imagery. Customer service, trust, and relationships are an integral part of the agricultural insurance industry. However, there are ways to improve the efficiency and reliability of these in-person visits - whether through measuring the impact of an event ahead of time or using data to help prioritize where in-person information is needed. Both insurers and growers could benefit from the deep relationships and on-the-ground knowledge that imagery helps facilitate.

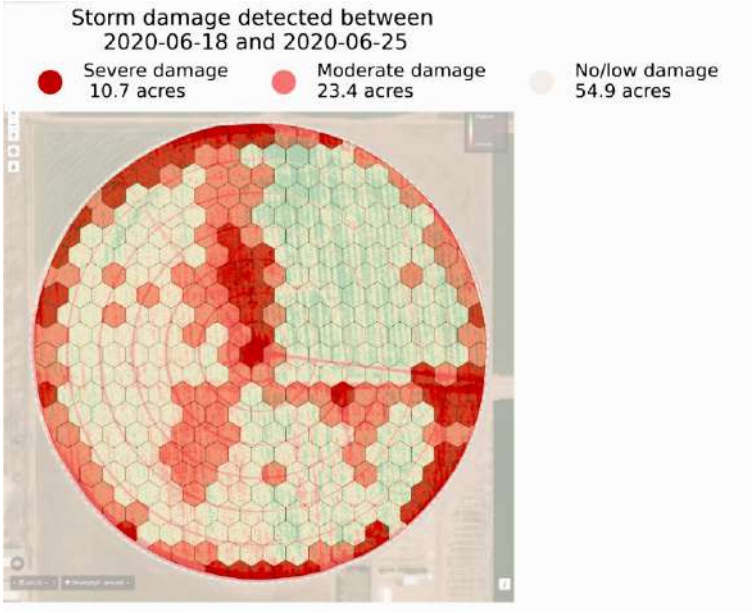


Figure 2: A series of severe thunderstorms stalled over the Texas Panhandle and dumped up to 5 inches of rain and had wind gusts up to 98 mph. Aerial images from Ceres before and after the storm precisely identify regions with canopy damage based on changes in chlorophyll. Estimated $10,820 loss ($121/ac, complete loss on 10.7 ac, and 50% crop loss on 23.4 ac).

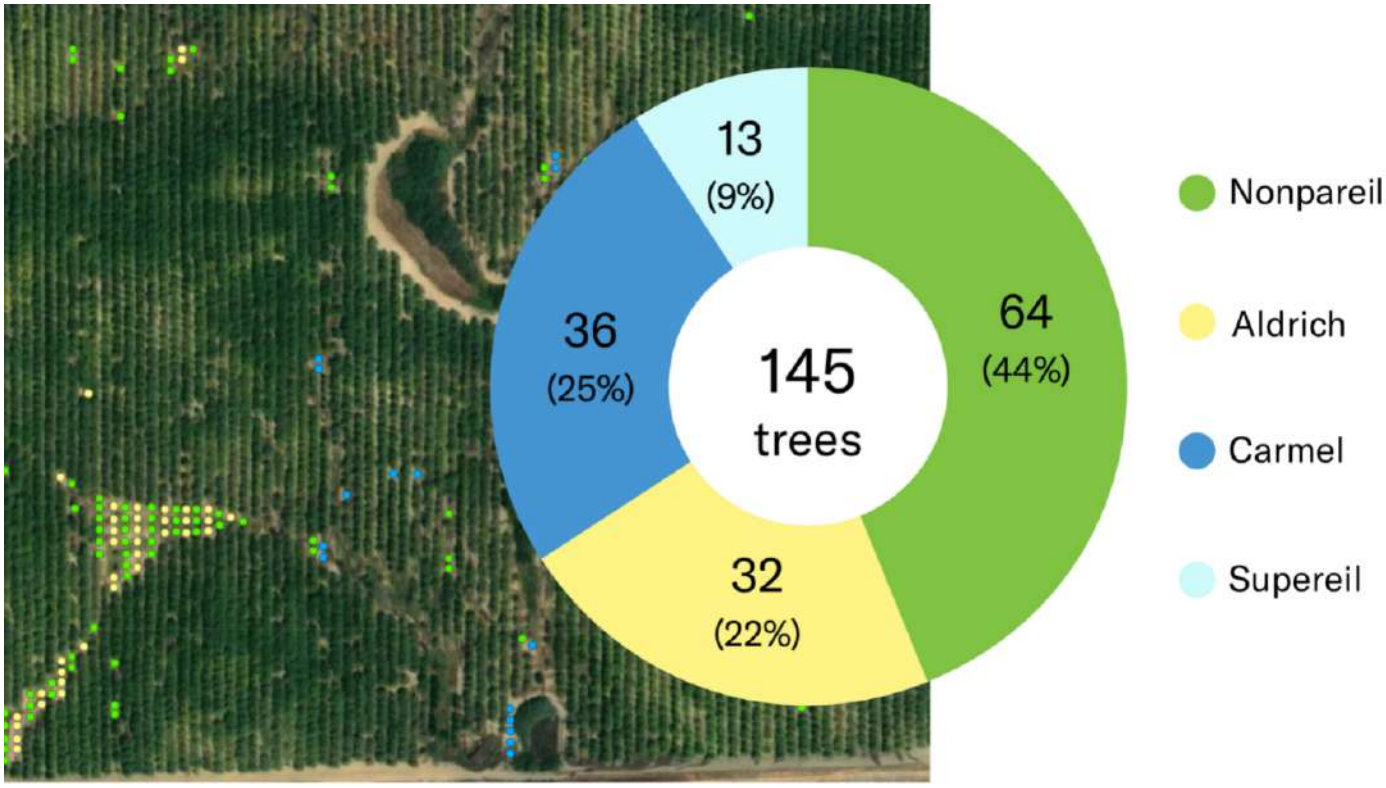


Figure 3: Ceres Imaging uses high-resolution imagery and crop-specific data models to distinguish not only between crops and ground cover but between individual trees and trees of different varietals. This makes it easy to calculate the impact on revenue and yield in the aftermath of severe weather events.

HxGN LIVE Global

Connected Cities and Services Summit

Digital reality for critical infrastructure and services

Join us at HxGN LIVE Global 2022, Hexagon's digital reality solutions conference that will bring visionaries from around the world to discuss, debate and experience the autonomous future across seven educational, industry-specific summits.

Discover how to better position your organization for the connected future at our Connected Cities and Services Summit.

hxgnlive.com/global

Pixel Vision - Turnkey Survey and Inspection Solutions Across Industries

A Talk with Ashish Airon, Director, Pixel Vision

Pixel Vision has developed a robust, modular, and scalable cloud-based platform to analyse geospatial and imaging data.

Pixel Vision's technology, which uses cutting-edge machine learning techniques, can ingest data from a variety of drones and satellites. It's also built to generate customized, actionable output in a variety of forms that may be readily incorporated into enterprise workflows.

We had a great opportunity to have a questionnaire with Ashish Airon, Director at Pixel Vision. He has shared interesting insights on his journey from college graduate to entrepreneurship. He also talked about product and services offered by Pixel Vision and the use of remote imaging and AI-based analytics to revolutionise operations and maintenance of industrial assets.

The questionnaire follows as...

GIS Resources - Pixel Vision Team, thanks for taking the time. You are a team that includes members of Forbes' 30 Under 30, graduates of the University of Oxford. So, how has been the journey from college graduates to entrepreneurship.

Ashish Airon - For us, it is not our first venture. We have in the past managed and run companies. This time we are making sure to not make the same mistakes and execute at a faster pace. It is always interesting to see how much back and forth work can be saved due to past experience. But at the same time, each business is different and comes with its own challenges. We strongly believe that to establish a good fundamental business model you need to spend enough time on it. And we are taking a long-term strategic view on how we want to shape the company's trajectory over the next 10 years or so.

GIS Resources - What instigates you to start a company that brings remote imaging and AI-based analytics to revolutionize operations and maintenance of industrial assets?

Ashish Airon - Technology has always excited us from the beginning. The exciting part here was we got to do things on the ground, be it understanding the asset, flying drones, or understanding the problem statement. It is a much more hands-on experience compared to building a traditional software company where this might not be the case.

Ashish Airon

A serial entrepreneur having founded CogniTensor, and BlitzBusiness.

He was awarded Forbes 30U0 Asia for his contribution in technology and holds a masters in Computer Science from Oxford University.

At the same time, we truly believe the government has made an excellent initiative and the ecosystem will only evolve and we will see the entry of many more players.

GIS Resources - What made you believe that this (industrial asset management) is a problem area for infrastructure companies and it's an untapped opportunity to do a business in India?

Ashish Airon - We see this as an opportunity rather than a problem and to us, it's not just about infrastructure companies, it applies equally to any entity that owns large-scale infrastructure assets such as solar farms, roads and bridges, railways, wind turbines, electricity generation and transmission infrastructure, telecommunications towers, mines, etc. It's not so much that these companies have a problem but that drones represent a faster, cheaper, and more accurate way to improve operations and maintenance. What this means is that costly failures and downtime can be avoided in a way that was not possible earlier. The bottom line is that this technology allows assets to operate at higher efficiency and longer than was previously possible.

GIS Resources - Tell us about your product/solutions and services, and how AI & ML are used to create an Intelligent Asset Management Platform?

Ashish Airon - There is a lot of hype around AI and ML. We have developed a software platform that uses both traditional as well as newer AI and ML-based techniques to analyze and parse data collected by drones and satellites. What AI and ML add to traditional methods is that they allow us to customize our output and achieve much greater accuracy than would otherwise be the case. For instance, AI allows our software to quickly 'learn' how to classify different types of errors in a way that traditional software struggle with. Without AI, the software can mark 'hotspots' or 'cool spots' on solar panels but a human would be required to sit in front of the computer or visit the site to understand what the specific problem was. AI allows the human to 'train' the software to do this classification, thereby saving a lot of time and expenses, as well as increasing the accuracy of the output.

GIS Resources - Which industry sectors can leverage Pixel Vision solutions? What benefits does a user have in terms of cost and time?

Ashish Airon - Our solution is a horizontal solution that can be utilized across sectors. For example, in agriculture, we have built in-depth crop-specific expertise ranging from soil and plant health assessment to pest and disease detection to water stress level monitoring. This allows us to ensure that we aren't trying to force a one-size-fits-all solution on our clients. Our offering for an organic tea plantation will be different from our offering for a cotton farmer cooperative as the former are worried about compliances and red spider mites while the latter is worried about pink bollworms and monitoring inter-cropping.

GIS Resources - What various platforms you are using for surveying and imagery acquisition? And I am sure Drones/UAVs must be an integral part of this. If so, with new regulations by the Government of India related to Drones/UAVs, what's your take on ease of doing business with Drone/UAV-related business?

Ashish Airon - Ease of doing business has definitely improved but frankly it is still a challenge. The two main challenges - and we see this as a chicken and egg problem - are to do with regulation and awareness. Because the regulation is ambiguous at times and because local authorities are often unaware of policy shifts, executing projects on the ground can be tricky at times. Clients are uncomfortable testing new technologies in this environment of less-than-perfect clarity, especially when the traditional alternatives are still available.

GIS Resources - Would you like to share the biggest achievement of Pixel Vision, such as fundraising or awards?

Ashish Airon - There is no single achievement we'd like to focus on but it is very rewarding to build a team and also to introduce industry veterans to new tools and techniques and earn their business and their trust. Currently, our focus is to remain bootstrapped while we build strong credentials in the market and to focus on client satisfaction before we start fundraising and/or plan any marketing activities.

GIS Resources - Final question, any closing comments to our readers?

Ashish Airon - We feel strongly that the arc of new technologies is such that people overestimate how much is possible in the short run and underestimate how much impact they will have in the long run. We do not believe that drones will revolutionize all asset management overnight. However, we do believe that the most likely outcome is for drones to keep increasing their penetration in inspection and surveillance tasks over the next 5-10 years until they are regarded as a key part of regular operations and maintenance. Our strategic decisions are grounded in this conviction.

BUSINESS

March 16, 2022 - June 15, 2022

Overwatch Imaging Raises $11 M for Airborne Imaging Systems

Overwatch Imaging, a leader in airborne imaging systems for piloted aircraft and drones, has announced the close of an $11.15 million Series A round. The company designs and manufactures precision imaging systems with custom onboard AI software for large-scale, time-critical special mission and civil applications. Squadra Ventures and Shield Capital co-led the round. They are joined by strategic investors L3Harris Technologies and Bridger Aerospace, as well as the Portland Seed Fund. The funds will be used to accelerate Overwatch Imaging's growth worldwide.

Locana Awarded Wildlife Habitat Analysis Task Order for The Bureau of Land Management

Locana, a leading geographic data and technology company, has won a 10-year National Geospatial Data and Technology Support Services contract for the U.S. Bureau of Land Management (BLM). Under this contract, Locana has been awarded a Task Order to support the agency's Wildlife Habitat Spatial Analysis Lab which leverages geospatial data and analysis to inform decisions on wildlife management.

RMSI Appoints Ravi Santhanam as Vice President – Business Development

RMSI has expanded its global sales leadership team with the appointment of Ravi Santhanam as Vice President – Business Development. Ravi will be responsible for driving RMSI's Utility business growth strategy across the world. Ravi will be based out of New Jersey, North America.

SI Imaging Services and GHGSat will Gain a Foothold for Carbon Neutrality with Satellite Imagery

SI Imaging Services (SIIS), a firm providing high-resolution satellite imagery, will operate a joint booth with GHGSat, a methane tracking satellite firm in Canada, at the World Gas Congress 2022 (WGC) held at EXCO in Daegu, South Korea, from the 23rd May for five days. The World Gas Conference is the world's largest international gas conference that has continued its 90-year history and tradition and will be held in Daegu for the first time in Korea. Governments, NGOs, industry officials, environmental experts, and technical experts from each country exchange their knowledge, technology, and information on gas and discuss the development and energy agenda of the global gas industry.

RMSI Appoints Arun Vishwanathan as Vice President – Business Development

RMSI has expanded its global sales team by appointing Arun Vishwanathan as Vice President – Business Development. Arun will focus on driving RMSI's telecom business growth in North America, managing existing key clients, winning new telecom clients, and expanding RMSI's business through strategic acquisitions.

Datacubes for Environment and Security

Rapid environmental changes due to climate change call for innovative technological approaches. NATO has started a new project exploiting Big Earth Datacube Analytics for Transnational Security and Environment Protection. The multi-national kick-off meeting in Brussels demonstrates encouraging efforts.

RIEGL VZ-i Line Scanners for Permanent Monitoring Applications and Integration Capabilities into Customers Risk Management

In the context of climate change and the expansion of areas of urban settlement, e.g., in Alpine regions, the demand for high-quality datasets as well as the integration into risk management as an early warning system are constantly increasing. RIEGL's latest developments in LiDAR technology allow permanent laser scanning (PLS) installations in endangered areas and their integration into real-time early warning systems. Integrated to the DMT SAFEGUARD monitoring solution, tailored solutions for customer risk management can be offered now.

Topcon Solution Designed to Benefit U.S. Farmers and Crop Insurance Adjusters

Topcon Agriculture and MyAgData have collaborated to facilitate and improve access and data sharing involving electronic grain cart load data, creating a more streamlined workflow for farmers and a more efficient remittance process for crop insurance adjusters. Recently announced changes to the USDA Risk Management Agency's Loss Adjustment Manual addressing the acceptance of data from "non stationary" scales will impact this automated solution approach.

Leica Geosystems Opens Nominations for Carl Pulfrich Award 2022

Leica Geosystems requests professionals in the fields of photogrammetry, remote sensing and earth imaging to submit their nominations for this year's Carl Pulfrich Award. The award recognises innovations that advance the industry.

Trimble Introduces High-Accuracy OEM GNSS Receiver Module for Industrial Autonomy Applications

Trimble has introduced the Trimble® BD9250, a dual-frequency OEM GNSS receiver module that supports Trimble RTX® correction services. The receiver is designed to deliver high-accuracy positioning for a range of high volume, autonomous-ready applications used in the agriculture, construction, robotics and logistics industries worldwide. The BD9250 is a compact receiver with an industry-standard form factor and pinout, allowing for easy system integration and configuration.

Trimble and Infotech Expand Collaboration to Improve Inspection Process Efficiencies for Civil Infrastructure Projects

Trimble and Infotech® has announced an enhanced collaboration to improve the inspection process for civil infrastructure projects. Through the connection of Trimble® Access™ field software and Infotech's Appia® service, the software integration streamlines the workflow from survey to construction to provide high-accuracy measurement workflows for daily work reports and inspection reporting for inspectors in engineering, construction and local public agencies.

Chennai to Fight Crime and Criminal and to Map Public Utilities using GIS

Chennai police department planning to create a crime mapping system that will use GIS to detect crime hotspots. The GIS-based mapping system will improve police intelligence by giving data-driven, reliable information on crime and criminals. The new system will assist the police in making use of data and information to provide them with precise decision-making knowledge.

Leica Geosystems Announces Major Performance Increase in Airborne Bathymetric Survey

Leica Geosystems has announced the introduction of Leica Chiroptera-5, the new high-performance airborne bathymetric LiDAR sensor for coastal and inland water surveys. This latest mapping technology increases the depth penetration, point density and topographic sensitivity of the sensor compared to previous generations. The new system delivers high-resolution LiDAR data supporting numerous applications such as nautical charting, coastal infrastructure planning, environmental monitoring as well as landslide and erosion risk assessments.

Quantum Technology as Supplementary Navigation Solutions

Quantum technology has attracted a lot of attention in the scientific community. It is often claimed that this technology will revolutionise many sectors, such as computing, sensing and communications. The European Space Agency (ESA) is not behind in this race for developing new innovative technologies. ESA initiated the NAVISP programme to explore the potential of quantum technology for space applications. The NAVISP programme is a public-private partnership between ESA, the European Commission and the satellite navigation industry. It aims to support activities that benefit European citizens and businesses by developing new applications and services based on Galileo and EGNOS.

Tamil Nadu Pushes Agriculture Budget for Use of AI, Remote Sensing, and Drones

Tamil Nadu (India) Agriculture State Budget for 2022-23 emphasizes the use of technology such as IoT, Artificial Intelligence, Drones, and Remote Sensing, as well as a role for industries and other associated departments in ensuring remunerative prices for farmers and increasing job prospects in the farm sector. State Agriculture and Farmers Welfare Minister M R K Panneerselvam announced that the Tamil Nadu Small Industries Development Corporation (TANSIDCO) will establish an industrial estate for agro products in the Tiruvarur district to ensure farmers receive fair prices for their produce while also creating job opportunities. Drone infrastructure will be built in Tamil Nadu Agricultural University and its constituent institutions, research institutes, and Krishi Vigyan Kendras to alleviate labor shortages and assure the exact application of essential agricultural inputs in farmers' fields. During 2022-23, 60 drones would be procured at a cost of Rs 10.32 crore under the agriculture mechanization – Kisan Drone scheme

Satellite Data Help to Detect Artisanal Mining – GAF AG Develops the "ASM Alert" Web Platform

GAF has developed and implemented an easy-to-use web-based system to recognize indications of unlicenced artisanal and small-scale mining (ASM) in tropical forests – the "ASM Alert" platform. The platform combines free and publicly available satellite data – in particular, European Copernicus Sentinel imagery – with a number of other geodata layers and machine-learning for the analysis. The platform then enables the ordering of commercial, very-high-resolution (VHR) satellite imagery for the identified target areas. The implementation project is being conducted by GAF, Germany, together with the partner IES, Netherlands, and is funded by the European Space Agency (ESA).

Britain to Utilize Location Data to Support EV Charging Points

Location data is a key component of the EV charging process. The use of location data to support EV charging points or electric vehicle chargers is a key part of the shift to a zero-emission transport sector. Location data helps inform decision-making about where chargers are needed and how they are used. It supports the installation, operation, and management of EV charging points by providing information on the location of charge points and their availability. The use of location data in this way is expected to grow significantly over the coming years as electric vehicles become more popular.

CORS Network to Complete Digital Land Resurvey in Kerala

Kerala State Government has given a nod to extended Digital Land Resurvey for 1,550 villages at cost of ₹807.98-crore. The project is expected to complete the resurvey of land over four years in four phases. The project aims to do away with conventional methods of land surveying and to adopt new technologies. The new technologies are aimed at unifying land-related documentation under the departments of revenue, survey, and registration.

Trimble Catalyst Handle Adding Flexibility and Get Rid of Pole

Trimble has recently introduced the Trimble Catalyst handle, which adds a new level of flexibility to accessing GNSS. Precise GNSS data collection of features/points of interest like an electric pole, manholes, road sign inventory, and underground utility location and roadway inspections typically involves pole setup and a compact GNSS with survey-grade precision.

CORS Network to Complete Digital Land Resurvey in Kerala

Kerala State Government has given a nod to extended Digital Land Resurvey for 1,550 villages at cost of ₹807.98-crore. The project is expected to complete the resurvey of land over four years in four phases. The project aims to do away with conventional methods of land surveying and to adopt new technologies. The new technologies are aimed at unifying land-related documentation under the departments of revenue, survey, and registration. K. Rajan, Minister for Land Revenue, Survey and Land Records, Land Reforms, Housing, Government of Kerala said that administrative sanction has been given for the first phase which will cover 400 villages at a cost of ₹339.43 crores under the Rebuild Kerala development program.

Medium Format Cameras Used with SimActive Software to Minimize Mapping Costs

SimActive announces the use of its Correlator3D product by Beacon Aviation, Inc. to reduce costs of mapping projects. Operating across the Midwest, Beacon routinely maps long corridors for powerlines or transportation right of ways, large mining operations, and entire water districts. Specifically, Beacon uses a Phase One camera with a military-grade IMU which can be mounted in any of their fleet of small aircrafts.

YellowScan Announces a New Partner in Vietnam, Dat Hop

YellowScan has announced the newest addition to its ever-growing YellowScan Global Partners Network, Dat Hop Co. Ltd. Dat Hop is known as one of the leading companies in supplying products and solutions for Geospatial industry and Hydrographic survey solutions in Vietnam.

Woolpert Selected by Pacific Community (SPC) for Topo-Bathy Lidar, Aerial Imagery in Vanuatu

Woolpert has been contracted by the Pacific Community (SPC) to acquire, process and deliver topographic and bathymetric LiDAR data and aerial imagery for Vanuatu, a nation of multiple islands in the South Pacific. The project, funded by The World Bank, will help Vanuatu and SPC improve disaster resilience and response, conduct infrastructure planning, monitor the impact of climate change, and develop tools and systems to support coastal and hydrologic analysis throughout the islands.

HERE Powers BMW Maps with Predictive Routing

HERE Technologies has announced its latest predictive routing capabilities are powering the innovative “Learning Navigation” feature of BMW Maps as part of the BMW Operating System 8. HERE Predictive Routing gives in-car navigation an individual touch. The functionality learns an individual driver’s mobility patterns to improve and personalize the driving experience.

SimActive Releases Correlator3D Version 9.1 with Productivity Enhancements

SimActive announces the release of Correlator3D version 9.1, which features several productivity enhancements such as the support of new sensors as well as new features and to ease image processing. New capabilities include the management of multiple LAS files and the activation of email notifications to remotely monitor progress of processing. Importing data from the new MicaSense Red Edge P sensor and the Pléiades Neo satellite is also now possible.

PRODUCT LAUNCH

March 16, 2022 - June 15, 2022

Toshiba Palm-sized LiDAR with a Range of 300m

Toshiba recently announced significant progress in downsizing the laser projector portion of their LiDAR to one-quarter the size of the previous iteration, which was introduced in June 2021. Using two of the new projector modules, the new LiDAR has a volume of only 206 cubic cm and can fit comfortably into the palm of the hand. It now has a range of 300m and an industry-leading image resolution of 120084 pixels. It can be built with a variety of flexible projector unit combinations to address a wide range of long-range and wide-angle detecting applications.

TatukGIS Integrates Road Shields

TatukGIS announces integrated support for highway and route shields in its GIS SDK and desktop GIS products. A built-in SVG symbols library provides easy access to shields commonly used to label road and highway maps in the United States, Canada, Europe, and countries around the world.

PlanetObserver Releases the most Beautiful 10m Global Imagery Basemap

PlanetObserver has announced the release of PlanetSAT Global 2022, a basemap that provides ready-to-perform, cloudless,and homogeneous imagery. With outstanding 10-meter resolution, PlanetSAT Global imagery basemap provides access to detailed geographic information from global scales all the way down to 1:50,000 map scale. One major feature of PlanetSAT basemap is the updates that we release on an annual basis and imagery content continues to grow.

Leica Pegasus TRK Reality Capture Mobile Mapping System with AI and Autonomous Workflows

The Leica Pegasus TRK Reality Capture Mobile Mapping System is the latest advancement in reality capture technology. Leica's Pegasus has been on the market for a few years, but this new product offers an unparalleled user experience with its wireless connectivity and fold-up design. The Leica Pegasus TRK is perfect for capturing fast-moving objects or scenes that are too dangerous or difficult to access. It also has multiple sensors, real-time kinematic (RTK) positioning, and cameras to ensure 360° coverage and accuracy.

Qualcomm and Trimble Introduce Meter-Level Location Accuracy for Smartphones

Trimble and Qualcomm Technologies, Inc. has announced the availability of Trimble RTX® GNSS technology for Snapdragon® 8 Gen 1 and Snapdragon 888 Mobile Platforms. This technology enables superior location capabilities in premium Android smartphones worldwide. The integration of Trimble RTX GNSS technology, a correction services platform, with Snapdragon contributes to ahigher quality, more accurate location-based user experiences—such as car navigation with lane-level guidance.

Leica AP20 AutoPole - World's 1st Tilt-compensated Total Station Pol

Leica Geosystems has announced the introduction of the Leica AP20 AutoPole - an innovative solution for automated total stations that boosts productivity to the next level through tilt compensation, automatic pole height readings and unique target identification.

GEO EVENTS

June 20-23, 2022
Hexagon Live Global
Las Vegas, USA
https://hxgnlive.com/global

June 20-25, 2022
8th ICCGIS 2022
Nessebar, Bulgaria
https://iccgis2020.cartography-gis.com/

August 23-28, 2022
FOSS4G 2022
Firenze, Italy
https://2022.foss4g.org/

September 6-8, 2022
Commercial UAV Expo America
Caesars Forum, Las Vegas
https://www.expouav.com/

September 19-22, 2022
EuroCarto 2022
Vienna, Austria
https://eurocarto2022.org/

November 7-9, 2022
Trimble Dimensions+
Las Vegas, USA
https://bit.ly/3IiYm5T

November 15-17, 2022
Geo Smart India 2022
Hyderabad, India
https://geosmartindia.net/

December 07-08, 2022
National Disaster Expo Asia 2022
Singapore
https://www.naturaldisastersshowasia.com/

February 13-15, 2023
GeoWeek 2023
Denver, CO, USA
https://www.geo-week.com/

NATURAL DISASTERS EXPO ASIA 2022

7-8 DECEMBER 2022

SINGAPORE EXPO, SINGAPORE

THE WORLD'S LEADING EVENT SERIES FOR THE MANAGEMENT AND MITIGATION OF NATURAL DISASTERS

300 SUPPLIERS SHOWCASING THE MOST INNOVATIVE PRODUCTS & SERVICES

100 LIVE DEMONSTRATIONS | **3,000** VISITORS | **200** INDUSTRY LEADING SPEAKERS

ASIA 2022 HEAT & FIRE EXPO

ASIA 2022 STORM EXPO

ASIA 2022 FLOOD EXPO

ASIA 2022 EARTHQUAKE EXPO

REGISTER TODAY FOR YOUR FREE TICKETS

www.NATURALDISASTERSSHOWASIA.com

#NDEASIA | #FLOODEXPOASIA | #HEAT&FIREEXPOASIA | #EARTHQUAKEEXPOASIA | #STORMEXPOASIA

COMMERCIAL UAV EXPO

SEP. 6-8, 2022

CAESARS FORUM / LAS VEGAS

DRONES FOR SURVEYING & MAPPING

- Photogrammetry & Lidar
- Topographic Surveys
- Asset Management & Inspection
- Integrating drone data into GIS programs
- New sensor options

LEARN

Expansive education program with **solutions-oriented presentations** & workshops from **UAS thought-leaders**

CONNECT

Facilitated **networking**, **matchmaking**, and focused **roundtables**, with drone industry professionals from over 70 countries

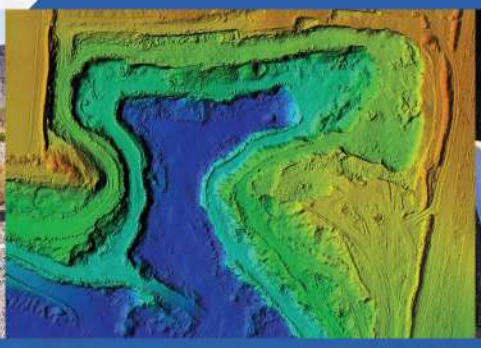
EXPERIENCE

Cutting-edge UAS solutions providers, live outdoor **drone demonstrations** & exclusive **training**

Registration will open in May.

Use code **SAVE100** for an additional $100 off a Full Conference Pass!

expouav.com



Produced by Diversified Communications

THE COMMERCIAL UAV EVENT FOR:

Construction | Drone Delivery | Energy & Utilities | Forestry & Agriculture | Infrastructure & Transportation | Mining & Aggregates | Public Safety & Emergency Services | Security | Surveying & Mapping