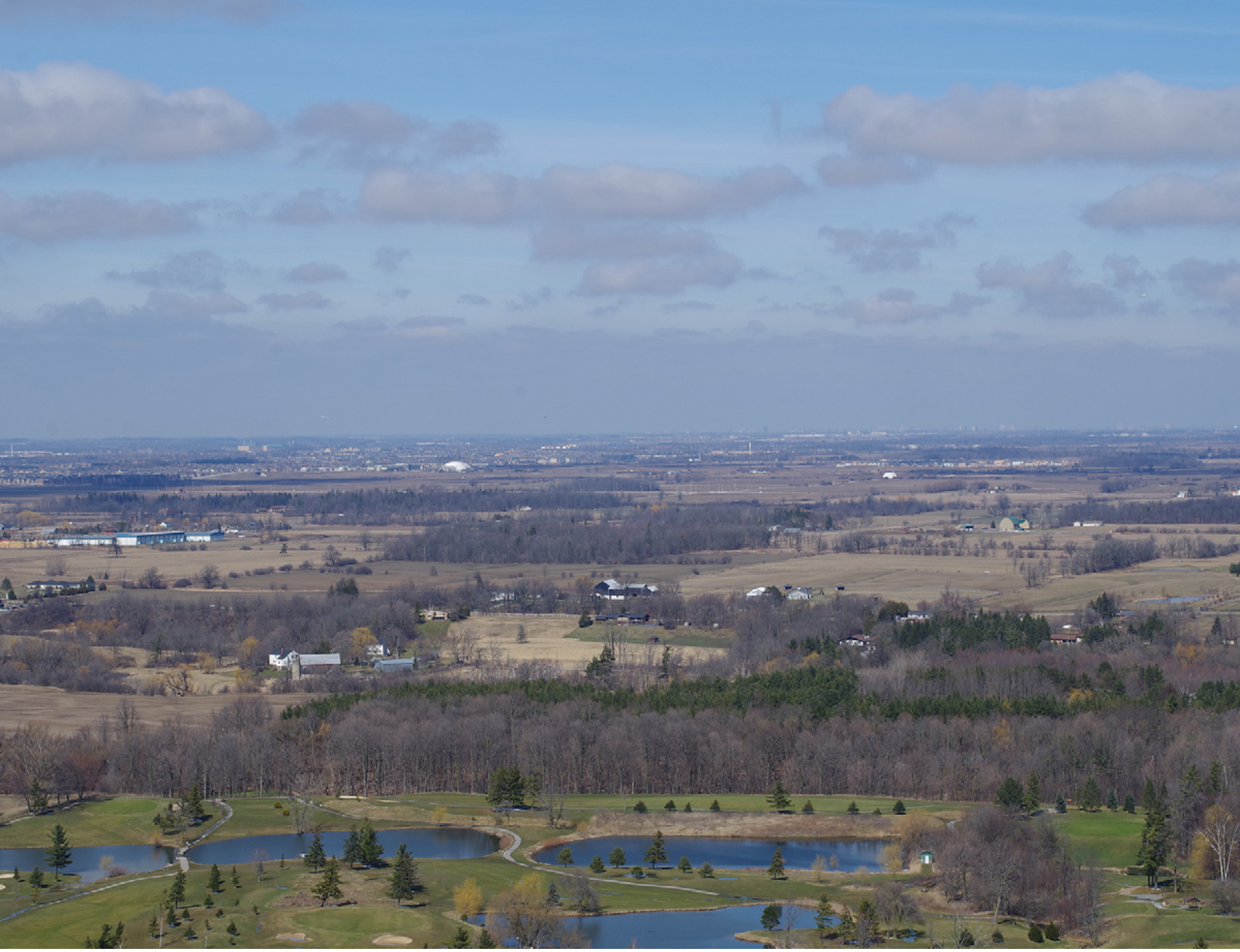

Surveying & Mapping with UAVs

By Jeremiah Karpowicz

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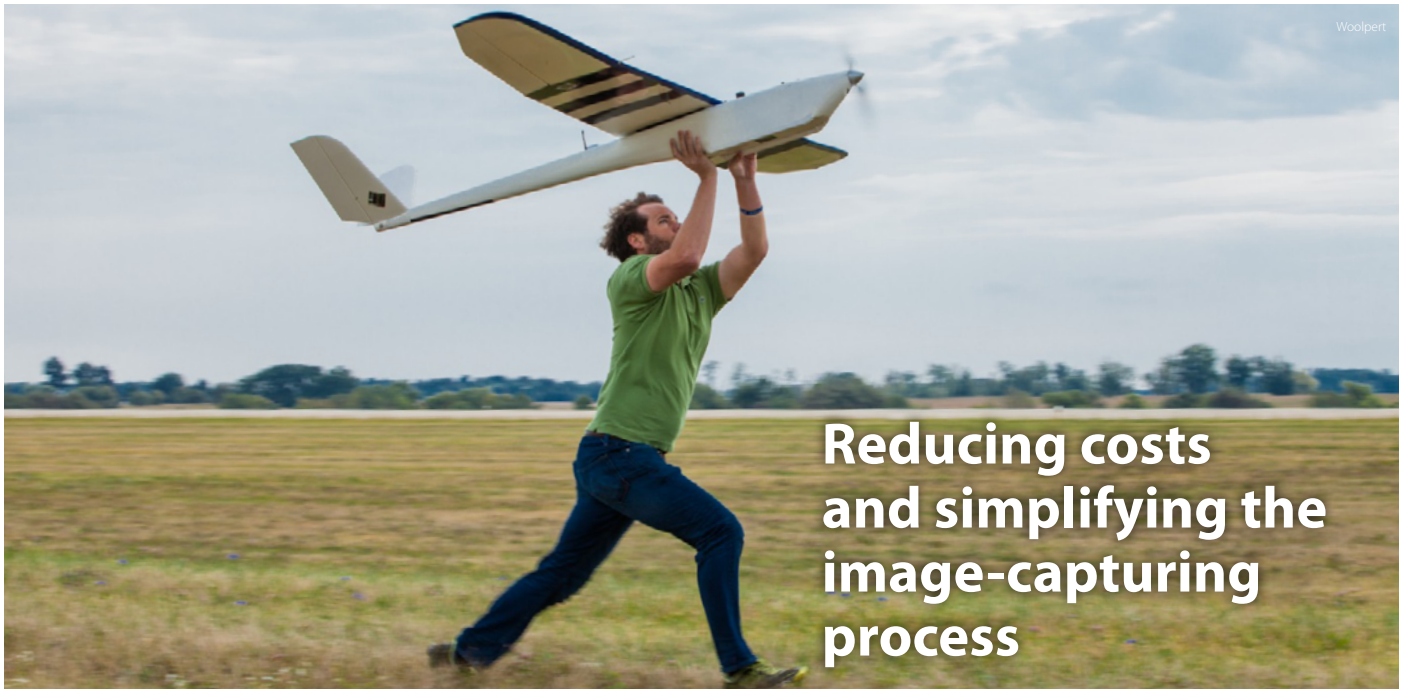


Reducing costs and simplifying the image-capturing process

By Jeremiah Karpowicz

IT'S EASY TO SEE WHY surveying and mapping professionals have taken such a keen interest in unmanned aerial vehicle (UAV) technology. Gathering info from the sky has been an approach that's been utilized for a long time now, but the costs associated with traditional manned aircraft makes the endeavor extremely expensive. UAVs offer a cost effective alternative with far more flexibility in terms of being able to get into the air quickly and without as much logistical support.

What's more, UAVs can improve data collection accuracy and efficiency, optimize a workflow while also enabling the production of cost effective turnkey DSM's and orthos whenever they're needed. Simply put, UAVs can make it far easier to gather the info needed to create maps by reducing costs and simplifying the image-capturing process.

> "UAVs can improve data collection accuracy and efficiency, optimize a workflow while also enabling the production of cost effective turnkey DSM's and orthos whenever they're needed."

However, right now the application of drones in the field is very much a niche endeavor, and that is mostly due to FAA restrictions. Most of the people doing UAV-based mapping are doing things that would have been on the fringe of what was already being done, because that's the only work that can be done by professionals, even if they've received their 333 Exemption. Those limitations are something that Lewis Graham, President and Chief Technical Officer of GeoCue Corporation, has run up against.

"What I'm seeing is a lot of hype about drones, but people are really groping to find the sweet spot for existing work in terms of when it makes sense to use a drone versus manned aircraft," Graham said. "If you're looking at 10,000 acres of cornfields, a drone doesn't make sense, and those details are sorting themselves out."

It's not just the regulations that are impacting the industry, as the technology has changed the conversation around service needs. Not too long ago it was extremely expensive to get hold of imagery, but there are so many inexpensive and even free options that the onus has shifted to sorting out details around processing and analyzing. Will professionals with years of experience change the way they operate? How will this impact experienced and innovative service providers?

The combination of technology tools that drones enable is clearly the biggest selling point. UAVs can be utilized along with photogrammetry, point cloud and conversion of point cloud data, to redefine service offerings. Before that can fully happen though, FAA regulations need to be sorted out.

"The 333 Exemptions have given people a glimpse of how these tools can supplement processes and procedures they're already using while also creating new opportunities."

FAA implications in the short and long term

THE IMPLICATION THAT DRONES are currently only a niche application in surveying and mapping is almost completely due to the restrictions that the FAA has placed on the technology. Jeff Lovin, Senior Vice President and Director of Government Solutions at Woolpert, mentioned that his company was the first surveying & mapping firm to get a 333 Exemption, but the impact of that early exemption has been somewhat hampered by the evolving FAA regulations.

"Even with our 333 Exemption, the regulations are still pretty restrictive and not very practical," Lovin said. "For example, we can fly at 200ft with no problem because of our COA (Certificate of Waiver or Authorization), but our system is optimized to fly at 400ft. That's only 2x the height, but it's actually 4x the images and flybys, so it makes that cost prohibitive. And not being able to fly over non-participants and near highways is very problematic."

These restrictions have slowed the use of drones for many companies, although the technology is there for UAVs to become a huge part of their business. Nonetheless, the 333 Exemptions have given people a glimpse of how these tools can supplement processes and procedures they're already using while also creating new opportunities. Eric Andelin brings 35 years experience to the mapping profession, and has worked with individuals and organizations to help them apply for and receive 333 Exemptions.

"If the FAA continues to work openly and make it easier for people to fly UAVs, then we'll start to see things move from the fringe toward projects we're currently doing within the capacity that UAVs can operate," Andelin said. "Time and distance are the big problems right now."

Those things have made drone operation in this field very restrictive. With those limitations removed, many already see the impact UAVs can have for large design projects and the DOT market, which includes highways, railroads, etc. The restrictions have caused many professionals to shift their focus toward figuring out how drones can be used most effectively when the legal limitations are lifted.

As frustrating as these barriers might be, there is a set path to seeing them eased or even eliminated, which will begin when Part 107 from the FAA comes out this year. While that ruling won't go far as some might like, it's an important milestone and will go a long way toward easing the regulations that are currently stopping surveyors from taking full advantage of UAV capabilities.

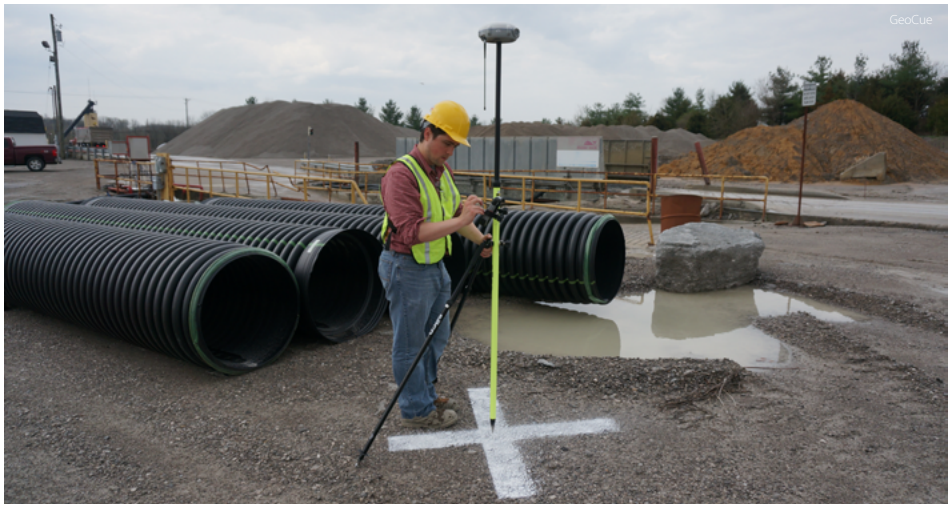

GeoCue

"The much lower costs have democratized the technology and allow many more people access to surveying tools. Because of this, drones have the chance to change the term of "mapping" or surveying" and broaden them in a powerful manner."

Ripple effects and ROI

WITH RESTRICTIONS LIMITING how drones can be utilized, many have struggled to see a return on their UAV investment, while others are already leery around the implications of the technology. The much lower costs have democratized the technology and allow many more people access to surveying tools. Because of this, drones have the chance to change the term of "mapping" or surveying" and broaden them in a powerful manner.

"It's a monetarily inverted market, and you seldom ever see that," Graham said. "It's the really cheap stuff that's dominating out there, and that's very unusual. If you look back at technology like digital cameras and laser scanners you'll see it was the opposite. You had high-end systems and it would filter down, but not always. We still don't have low-cost LIDAR, for example. The drones are the opposite though. When we introduced LIDAR into mapping, there were only three viable players for airborne LIDAR, but on the drone side it's just the opposite. There are hundreds of companies offering hardware and solutions."



This "race to the bottom" means something different to everyone in the ecosystem, but it's especially apparent for companies that have been around. Traditional photogrammetry companies are going to have a very hard time selling expensive software and equipment into this future market. The software has developed to a point that the work is simply easier to do, which further opens it up.

It's a topic that has created a ripple effect which can be seen throughout the industry. UAVs might not always do the actual data capture, but they're changing the way people think about how they can approach that work. The technology itself is getting people to think about how it can be utilized in innovative and unexpected ways.

"We've developed our own camera system in a pod that sits underneath a Cessna 182," Lovin mentioned. "Being in this pod allows us to swap in amongst aircrafts. We don't own a 182 yet, but this system collects 1cm and 2cm ultra-high resolution imagery just like a UAV. It's manned aircraft rules though, so we can fly as high and long as we need. I have to say I never thought how popular it would be, but it's become its own niche. We're taking a lot of leads and opportunities that would have otherwise been related to UAV in this area, and it's allowed us to differentiate the approach we're able to take in the air."

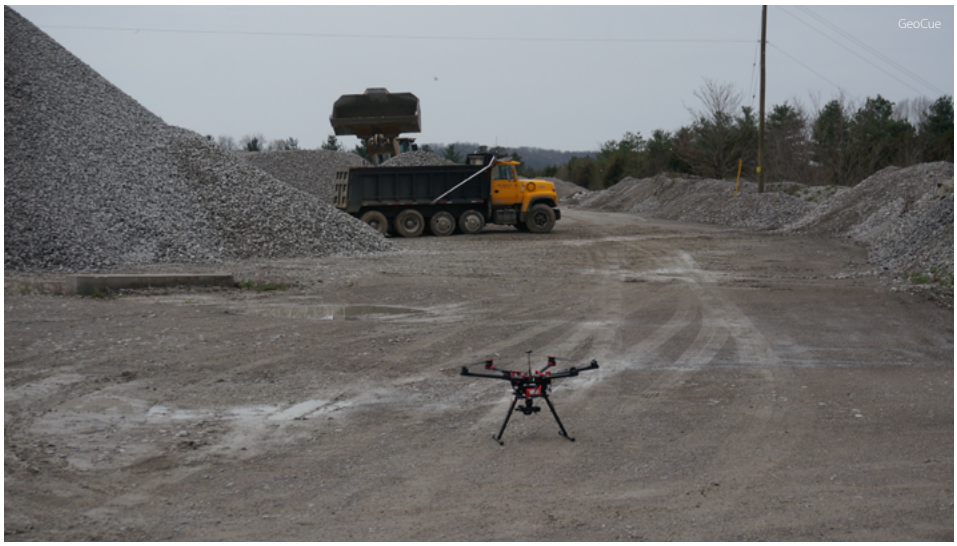
That different approach can be the main factor in whether or not someone sees a positive ROI. As amazing as it is to explore the new opportunities that drones directly create, examples like these are proof that just as much focus needs to be placed on the indirect ones.

"I'm most excited about the fact that we're completely disrupting the industry in the same way Uber has changed the way people get around, and the way PayPal changed the way people looked at payments."

Moving BLOS and onto other horizons

CURRENTLY, LEGAL RESTRICTIONS prevent operators from flying beyond visual line-of-sight (BLOS), which means they're limited to flying in close proximity. That severely limits the sort of things surveys are used to mapping and what they want to be able to map.

"BLOS is something that really makes UAVs a niche for us, because that impacts the cost when we can only fly within half a mile of the bay station," Lovin mentioned. "One of the most relevant applications for UAVs is going to be across utility corridors like gas lines. Using helicopters for that kind of work is really expensive, but when we can only fly in line-of-sight, you have to have so much more survey control. You have to land and take off, land and take off. Most of the time, that defeats the whole economy of the UAV."



The need to open up regulations is imperative, but it's not where the conversation ends. While most are anxious to simply have the opportunity to take advantage of current drone technology, there are still plenty of developments on the horizon. Being able to look at a 3D map and identify a place you want to inspect with a drone by programming it into your autopilot is something being actively worked on right now. Further developments to automation are going to see progress toward the ability to automatically extract data out of imagery, whether that's extracting 3D features, land cover, pavement, etc. That sort of capability has been long coveted by professionals and we'll soon be able to see a huge leap forward in both automated process and automated feature extraction which will be driven solely by UAV.

Rather than spending weeks to capture a small amount of info and process it in a few days, operators can now capture a much larger set of data in a single day and take weeks to process and analyze it. That sort of change is indicative of what sort of changes are just over the horizon.

"I'm most excited about the fact that we're completely disrupting the industry in the same way Uber has changed the way people get around, and the way PayPal changed the way people looked at payments," Andelin concluded. "We're changing a technology to focus on ease of use, and it's all being driven by technology that's been around. The whole imagery-as-point-clouds has been around. I remember talking about that 20 years ago. We just didn't have the processing power to do it. Now we do. Things like logistics of aircraft can be laid out with paper and pencil, but if you've got the right app you can redirect vehicles all day long. The technology has caught up to where we've seen it going for awhile now, and it's changed the way we think about our approach." ■

About the Author:

Jeremiah Karpowicz is the Executive Editor for Commercial UAV News. He has created articles, videos, newsletters, ebooks and plenty more for various communities as a contributor and editor. He has also worked as the Executive Editor for ProVideo Coalition where he was first introduced to UAV technology.

ERIC ANDELIN
President & CEO
Vertical Information Services, Inc. (VERTX)

Eric Andelin CP, GISP., brings 32 years' experience to the mapping profession. Eric's Geospatial background includes: Survey, Aerial Photography, Photogrammetry, GIS and Laser Scanning. In 2013 Eric began working with Unmanned Aircraft Systems (UAS) as a platform for aerial mapping acquisition and again after assisting multiple large engineering surveying companies and a few startups with UAS integration, decided to open his own UAS based aerial mapping company, Vertical Information Services, Inc., (VERTX).

LEWIS GRAHAM
President/CTO
GeoCue Group

Lewis is the President and Chief Technical Officer of GeoCue Corporation, a company whose focus is geospatial workflow management, particularly for LIDAR data processing. He is also the managing director of QCoherent Software LLC (a GeoCue company), a company that builds LIDAR data processing tools for the ArcGIS environment. Lewis currently serves as the Division Director for the ASPRS LIDAR Division and Chair of the LAS Working Group. Prior to founding GeoCue, Lewis was the CEO of Z/I Imaging, a company that created hardware and software for precision airborne photogrammetric mapping.

JEFF S. LOVIN CP, PS
Senior Vice President and Director of Government Solutions
Woolpert

As director of Woolpert's geospatial group, Mr. Lovin is responsible for overseeing the operations of nearly 230 staff members across the firm. With experience in photogrammetry, surveying and remote sensing, Mr. Lovin brings a high level of expertise to firmwide initiatives that support client needs at national and international levels. As director, Mr. Lovin is responsible for his group's growth as well as technological advancements that create opportunities for the firm and subsequently provide the highest level of client service.

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- Precision Agriculture

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Commercial UAV Expo is a conference and exhibition exclusively focused on the commercial sUAS (small Unmanned AerialSystems) market for:

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- Civil Infrastructure
- Process, Power & Utilities
- Mining & Aggregates
- Construction
- Law Enforcement, Security & Emergency Response, Search & Rescue
- Precision Agriculture

In the Conference Program, UAV industry experts share key insights into the issues large enterprise asset owners face when implementing UAS, including systems selection and integration; developing enterprise workflows, guidelines and policies; data management and integration; and legal, safety and regulatory considerations. Plenary sessions and panels cover topics of interest to all end-users regardless of industry while breakout sessions focus on UAV technology, applications and opportunities in the vertical markets listed above.

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