Putting UAVs to Work in Construction

By Jeremiah Karpowicz
WHEN IT COMES TO BEING able to photograph and document what is and isn’t happening on a construction site, professionals have historically had few options. Outside of a time-consuming manual process to gather such data by hand, project managers’ only real choice was to hire fixed wing aircrafts to document the info they were looking to gather. However, most flights needed to stay 500-1000 feet above ground level and were often unable to capture the detailed information that was needed due to airspace restrictions or logistical impossibilities.

UAVs have provided construction professionals with a new and powerful tool that enables better visualizations and more effective collaboration. Drones can be used to provide aerial overviews of projects that are in-progress or have been completed, and can be essential monitoring tools to ensure project managers know what is and isn’t happening on a site.

Drones have also had a major impact on safety concerns and issues. Rather than having a worker actively deal with a dangerous situation, UAVs allow operators to safely and effectively evaluate a potentially dangerous situation while also enabling them to stay out of the way of construction. As the Virtual Design and Construction Manager at The Beck Group, the difference in approach that UAVs represent is something Grant Hagen is very familiar with.

“Having a tool which allows us to operate safer and more efficiently has changed the way we perform work in the field,” said Hagen. “Think of it as an upgrade from a shovel to a backhoe. We are able to do more, work safer, and get the job done faster. These tools have bled into many different workflows on all sorts of projects. We are taking inspectors out of man lifts and man cages to verify work is being installed correctly or identifying an area of need.”

In a short amount of time, drones have impacted the approach construction companies can take, but there’s even been an evolution in terms of the approach itself. Some organizations
started using UAVs for aerial imagery and ortho-photos, but now they’re building point clouds and 3D models, and then utilizing all of this data collectively. UAVs have markedly improved the amount of data that users are able to capture, and the quality of the data has only gotten better.

Challenges around regulation and the right approach for a particular organization will continue to be issues, but the technology has already enabled a true revolution. How that change can and will continue to evolve is going to be impacted by a number of specific elements.

**All About the Data**

In a previous report that explored how UAVs were impacting the construction industry, challenges around being able to gather and process the vast amount of data that drones are able to capture was discussed in detail, and it’s a topic that continues to be sorted out. Being able to create a process that organizes raw information into something that’s usable and widely available often needs to be approached from a higher level, and that’s something Richard Lopez has been able to take the lead on in his role at Hensel Phelps.

“The key thing about data capture always comes down to answering a few questions,” Lopez mentioned. “What are we looking for? What type of data are we looking for? What’s our endgame? Most of the time, what we’re looking for are orthomosaic photographs. We can do a lot with that info. We can take that info into a number of different programs and create a number of different overlays. That’s what’s really important to us, and knowing that’s the data we need to capture and process is critical.”

Those considerations are a huge factor in terms of what data is processed first, where it goes after that initial stage, when people need to see this info, etc. Knowing what they want to do with this data allows operators to be specific in terms of the info they’re looking for, and UAVs give them the ability to locate and thoroughly scan these specific pieces of information.

What professionals can and are doing with this data is something that’s also changing. Brian Smith is the Director of Technology at IMCO General Construction, and the evolution drones have enabled in terms of the data they can capture and want to capture has enhanced what they’re able to do on a given project.
“The FAA doesn’t really have everything in place yet as far as commercial use, so in order to implement a UAS program at our company, I actually started a completely separate company, Reality Capture Systems, to take responsibility for it.”

“Drones went from being a picture tool to an actual data methodology that we use a lot for pre-construction and during construction,” Smith said. “We use them to track quantities of dirt as well as production quantities for excavation. They’ve augmented what we were doing previously, and the amount of data that we’re able to collect now is a tremendous amount more.”

Organizations like Smith’s often have a full staff of surveyors and GPS equipment, and they still use them for fine layouts and fine measurement to collect data points for surveys. However, they don’t use those surveyors to collect topographic information any longer because the UAV works so much better for what they need. This development represents a major shift in terms of the data operators are able to capture with a drone, as well as what they’re able to do with that data.

Problems and Solutions

The legislative restrictions around using UAVs are a major challenge for construction professionals, much like they are for operators in other industries. Applying for a Section 333 Exemption to be approved for commercial operation is an option for individuals and organizations, but many aren’t willing to take on the liability associated with rules and laws that could change at any time. However, the types of people that have been able to recognize the potential these tools possess aren’t the sort to be easily deterred.

“The FAA doesn’t really have everything in place yet as far as commercial use, so in order to implement a UAS program at our company, I actually started a completely separate company, Reality Capture Systems, to take responsibility for it,” Lopez said. “I went through the whole process for insurance, 333, etc. The reason I did that is because Hensel Phelps doesn’t want to be liable until everything is settled under the FAA. It’s been complicated, but I saw and believed in the technology, and it’s why I took this approach.”

That approach has enabled Lopez to create a process that could eventually be spread across Hensel Phelps once the regulatory pieces have been more fully defined. Being able to work within current regulatory limitations has allowed him to determine the specific ways drones will be able to impact the entire organization.

While it might seem like drones have created a different set of challenges in this regard, it’s
important to remember they also represent brand new solutions. Surveyors and engineers will typically have a solid grasp around the nuanced details of a project, but such things are often difficult for other stakeholders to fully comprehend. UAVs have proven to be the perfect tool to bridge that gap in understanding.

“Drones give us a whole picture instead of a piece of the picture,” said Smith. “Having a digital representation of the projects as a whole instead of just a piece helps people who aren’t on the engineering and design side understand how this piece interacts with something like a water treatment plan or dam, or what it impacts in the big picture. A 2D plan drawing doesn’t always show you how it all works together. 3D point cloud data has really helped people understand some of these things.”

UAVs have given various stakeholders the ability to see and comprehend details they wouldn’t have grasped using more traditional tools. They’ve provided many professionals with a better way to both detail and explain their process and project.

The Next Step

Accurate predictions around improvements to data collection and processing have been made before, and there’s no doubt the way in which UAVs are being utilized continues to change. That said, there really isn’t one development that’s going to lead to a revolutionary change. In many ways the industry has already experienced that revolution. The big change is now going to be around how these different parts and pieces come together to open up new opportunities.

“I believe a lot of people are looking forward to seeing how the automation of flight and the addition of more powerful sensors onto these units will change things, but a lot of that has already happened,” Hagen mentioned. “Making these units more intelligent with the software and hardware that is available right now will propel this market to even safer operations.”

Regulation is causing many individuals and organizations to hold off on a full-scale embrace of the technology, but that doesn’t mean things aren’t changing and developing. Smaller sensors, more accurate data and a more intelligent UAV platform are on the horizon.

These changes are allowing professionals to easily inspect and monitor hard to reach places on a project. They’re allowing operators to fly closer to buildings than ever before, and the impact they’ll have on safety is only beginning to reveal itself. To really comprehend the kind of evolution the industry is experiencing though, we need to understand how similar types of disruption have played out.

“My background is in Architecture, so I look at UAVs as the next evolution in the construction and architecture industry, just like when 2D cad drawings went to building information modeling,” Lopez concluded. “Now when they put drawing together, they build them in 3D. They build them virtually so you can walk through them. What UAVs are doing for this industry is allowing us to capture data that we couldn’t capture before. We’re able to view our projects and buildings in different ways. We can put thermal cameras on them to look for water infiltration. We can scan a building with an infrared camera and build a better building.”

Building a better building is something construction professionals in every phase of a project are extremely interested in, and UAVs are continuing to open up completely new approaches around how to do just that.
Grant Hagen is a Virtual Design and Construction Manager at the Beck Group, an integrated architecture and construction company based in Dallas, TX. Grant leads technology implementation at Beck through research, development, and training for Beck’s collaborative software/hardware platforms, including UAVs. Coming from the field, Grant acts as the filter for software/hardware research from the industry, to the project teams using the tools to become more efficient. Leading this effort at an integrated company, Grant has the opportunity to impact both industries, where UAVs have helped both disciplines become more efficient with this emerging technology.

Richard Lopez is with Hensel Phelps – Plains District, an employee-owned company that prides itself as a distinguished General Contractor, Construction Manager, and Design-Builder whose people are known as the best builders in the industry. Richard implements new technology and through research, development and training for Hensel Phelps with the advancement in UAVs. He is now implementing UAVs into the construction workflow. Coming from the architectural and technology industry, Richard acts as the filter for software/hardware research from the industry to the project teams, using tools to become more efficient and add value to the construction team. Leading this effort for integrating UAVs into Hensel Phelps, Richard has the opportunity to impact the construction industry; UAVs will help construction projects site become safer and become more efficient with this emerging technology.

Brian Smith is responsible for the overall planning, organizing and execution of all IT/GPS functions within IMCO General Construction. This includes directing all IT and GPS operations to meet customer and business requirements as well as support the maintenance of existing applications and development of new technical solutions. He also heads up the firm’s Virtual Design and Construction Group. He has over 18 years of experience in civil, structural, residential and commercial design.
About Commercial UAV Expo

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

- Surveying & Mapping
- 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.

The international Exhibition includes airframe manufacturers, component suppliers, software suppliers and service companies.

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