Connected Workflows: Drones in Construction

DIVE BRANDSTUDIO

A CONSTRUCTION DIVE PLAYBOOK

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$31 TO $46 BILLION. That's what McKinsey & Company estimates the annual impact of commercial drones will be by 2026. In fact, unmanned aerial vehicles (UAVs), commonly referred to as drones, will have a dramatic impact on the accuracy and speed of completion for construction projects.

While construction firms have watched the growing drone trend, many are slow to adopt because of a few key factors. For starters, they want to see that clear economic benefits outweigh the costs – and growing pains – of launching a drone program. Additionally, strict FAA regulations and the lack of ability to easily share drone data have also been cited as limiting factors.

In the last few years, however, drone programs have become much easier to adopt:

- Commercial drones are less expensive than they were just a few years ago, with most drone prices ranging from $1,000 to $5,000.
- The FAA released Small UAS Rule (Part 107) in August 2016 which allows anyone who passes the remote pilot certification exam to legally fly drones for commercial purposes.
- A growing number of integrations between drone solutions and construction technology platforms is making it easy to seamlessly and immediately transfer drone data between the jobsite and the office.

These factors combined set up drone technology for increasing project efficiencies and profits, and expansive growth in the construction industry.

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Drones in Construction: How Do They Enhance Operations?

Aerial data for construction sites is not new, but prior to drone technology, it was difficult and expensive to obtain because it was usually gathered by helicopters. Today, drones give the construction industry a safe, cost-effective view from the sky. In addition to capturing photos and videos, drones offer many functions to make the overall project run more efficiently, including:

- Tracking and communicating progress
- Managing materials and assets
- Carrying out surveillance
- Improving owner visibility
- Performing inspections
- Providing valuable information for improved design changes
- Increasing construction safety

With the images and data collected by drone platforms like Site Scan – made by 3DR, a drone technology company that counts Autodesk as an investor – users can create 3D models, maps (orthomosaics) and elevation models, as well as gather volumetric measurements, to name a few of the expanding tasks they can perform. All of this allows for better planning, site monitoring, daily reporting, safety and overall project development.

The high-quality data collected by a drone is integrated into the entire data collection process – not just another isolated data stream to be examined separately. This provides users the opportunity to view a construction site in real time as the project progresses, as well as better

DRONES GIVE THE CONSTRUCTION INDUSTRY A SAFE, COST-EFFECTIVE VIEW FROM THE SKY.

manage resources such as materials and labor, and keep projects on schedule.

Josh Cheney, industry manager of construction technology at Autodesk, explains: "The drone is scheduled to do a jobsite flyover to collect aerial footage – often on a weekly basis. The drone flies its course and takes photos of what's happening on the construction site. The result is an orthomosaic file that can be used for a variety of different workloads."

With this data flowing into a construction management platform like Autodesk BIM 360, users can layer files – enabling a comparison between what is actually taking place (the drone imagery) with what was intended to take place (the construction documents). "This is incredibly helpful for anyone who manages the job," notes Cheney. "They can see what the architect, the project owner and the construction company intended to do versus what's actually being done. This can be used in a number of ways – from project process to safety and from material deliveries to payment schedules."

Additionally, with enterprise drone platforms like Site Scan, people have the ability to view a project from anywhere – the office or on the go – without having to physically step foot on a site. This allows different parties to collaborate and expedites the decision-making process.

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The Drone's Expanding Capabilities in the Construction Lifecycle

Drone technology is on the brink of a huge industry expansion over the coming years. In fact, the construction industry is estimated to be the fastest-growing market segment for commercial drones from now until 2026.

However, some industry professionals fear that integrating new technologies, such as drones, will disrupt existing workflows. Companies recognize the value of these tools but often cannot justify the time it will take their people to learn how to integrate them into an existing process and still keep projects running smoothly.

Site Scan helps alleviate that fear by not only providing extensive onboarding and dedicated support, but also by giving users the ability to seamlessly take 3DR drone data and integrate it into BIM 360 at any stage of the construction process.

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Expertly Streamline Constructability Reviews During Preconstruction

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> – **ANDY LEEK**, *VDC Director at PARIC, a design/build construction firm in St. Louis*

Collecting accurate data during the preconstruction phase is paramount to the success of any project, and cutting-edge technology enables drones to be equipped with cameras, geolocation sensors, infrared sensors and more to capture precise details of the environmental and physical site. The additional project data that drones provide increases the overall successful outcomes of estimates, constructability and winning construction bids – and gives you a competitive advantage in an industry that’s known for very tight margins.

Drone data can be incredibly valuable during the planning stage, particularly to help a customer visualize the process. Andy Leek, VDC Director at PARIC, a design/build construction firm in St. Louis, said that during the planning of a senior living project in Wisconsin, PARIC used drone data to not only pinpoint constructability challenges, but also to open the lines of communication between the clients and the design team. “As builders, we see a project one way, but clients look at it differently,” explains Leek. “Drone images allow us to show and tell, and clients are able to see what we are describing much easier.”

Drone data platforms like Site Scan make it easy to pull CAD or PDF design files from Autodesk BIM 360 and overlay them onto orthomosaics collected by the drone. Orthomosaics are used to measure true distance and are an accurate representation of the Earth’s surface, so when design files are

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overlaid on them, users can compare design to reality to measure progress and spot mistakes before they become too costly to fix.

Additionally, when a design file changes in BIM 360, the overlay will automatically update in Site Scan – ensuring that you are always making key decisions with the most up-to-date plans.

"There are tools out there, like Google Earth, that provide mapping information," explains Leek. "But we wanted to get a more accurate picture of how a site looks now. A drone provides us with real-time, measurable information."

For example, during the design of a project, a company can overlay data captured by drones onto site and architectural plans, and simulate real-world scenarios to catch any discrepancies, such as crane positioning and movement – an issue that would be costly if they were not identified until later.

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Efficiently Improve Site Monitoring & Daily Reporting

As technology has advanced, importing large visual and data files captured by drones is as simple as a click of a button. Now the entire team can easily view and share orthomosaics, point clouds, digital elevation models and more into a BIM 360 account so it is easily accessible in tools like Revit, BIM 360 Glue and Field.

Data collected by drones is distributed immediately, making it accessible instantly by staff back at the office, and onsite by contractors and subs via their mobile devices. This near real-time data is critical in an environment that is constantly changing and can make the difference in whether or not a project stays on time and on budget.

Another way drone data can aid in collaboration efforts is by showing job progress. “If a contractor is obligated to provide progress photos to the project owner, from *a financial standpoint drones* provide instant ROI,” says Cheney. “This used to be an expensive process and logistical nightmare to hire a helicopter. Now drones can be operated autonomously, and you can do it on your own schedule.”

Leek shares one particular project where PARIC flew a drone across the project on a weekly basis to create a simple video. “This video didn’t take much extra time at all, but it gave the people financing the project comfort in being able to see the progress and know we were on schedule.”

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Skillfully Solve Jobsite Problems, Enhance Efficiencies & Promote Safety

Once the project is underway, the jobsite becomes a micro-community of constantly changing activity, and collaboration between stakeholders needs to flow smoothly. This is no small task. Contractors have found drones to be particularly beneficial during this phase of the construction lifecycle.

"The whole industry realizes that collaboration is key," says Nico Bonnafoux, Senior Customer Success Architect at 3DR. "You save money if you get everyone moving in a unified direction, and the way to do this successfully is to collect drone data onsite and distribute it to the field teams through the BIM 360 platform. It's not only virtual design teams getting value out of drone data; field engineers, superintendents, owners, contractors – everyone involved on a project – immediately has the data on their iPad, and can see where things were the day before, compare progress over time and catch any discrepancies."

Further, drones improve quality control and enhance material and subcontractor scheduling efforts. For example, drones can get a bird's-eye view of the material staging area, and if material isn't there, the drone data can immediately call attention to the issue before it becomes a costly delay.

Drones can also help locate thermal leaks and minute discrepancies that are imperceptible to the human eye. "Taking photos at various heights and angles is tough, but drones give you much more access to the jobsite than ever before," says Cheney. "It also is

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automated, so it's a small fix to the decreased labor force issue."

Another benefit of regular aerial data capture is its ability to collect invaluable documentation for billing or potential legal challenges. Among 3DR customers alone, examples abound of how using drones to document their jobsites has helped save tens of thousands of dollars and prevented costly legal disputes. "For example, one of our customers used their drone data to help win a dispute with a subcontractor who was significantly overcharging them. By having this accurate daily site documentation, our customer quickly resolved the dispute and saved over $100,000 without having to go to court," shares Bonnafoux.

Last, but certainly not least, the obvious positive impacts drones make on safety cannot be overlooked. According to OSHA, the leading cause of private sector worker fatalities in the construction industry is falls – nearly 39% in 2015. Instead of workers climbing stockpiles to measure a jobsite manually with a GPS stick, they can now do it with a drone, leaving both feet firmly planted on the ground.

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Getting Started with Drones

According to McKinsey & Company, the average commercial construction project takes 20% longer to complete than planned, and ends up being upwards of 80% over budget. Much of this is due to rework, quality control issues and scheduling inefficiencies. An integrated drone program instituted across all stages of a project lifecycle can cut these figures by thousands of dollars a day, making the return on investment extremely attractive.

Before instituting a drone program, however, companies should consider three key factors: cost, liability and resources capability – and cost should include the purchase of the drone, additional accessories/equipment, planning and set-up considerations, training a drone pilot and maintenance.

Some companies may consider outsourcing, but drones are not nearly as complex as they were a few years ago, when you needed a skilled pilot to fly the drone and specialty software to process and share the data. Today, with integrated platforms like Site Scan and BIM 360, this is all simplified and streamlined, often taking only a few minutes to get set up.

With simplification in mind, 3DR offers a dedicated support team to help customers implement drone technology safely and efficiently. Their helpful library of online training materials includes a study guide to help obtain an FAA remote pilot's license, as well as operation manuals to enable their customers to build standardized safety and operations procedures. "The onboarding process takes about four weeks," notes Bonnafoux. "It starts with obtaining a remote pilot's license and then shows pilots-in-training the steps to fly a drone on their own."

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He adds, “The best advice I can give any company considering a drone program is to identify the best person within your company to spearhead this initiative. You need someone who has a good idea of how the technology can benefit construction operations at each stage of the project.”

Another pro tip for those utilizing drone technology for the first time: figure out which data you actually need. Drones can capture a lot of data, but too much will create data overload. “Strategize your flight plan,” advises Leek. “This includes the time of day you will fly, what parts of the project you need to capture data on and the story you will tell with that information.”

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The Advancement of Drone Technology: What's on the Horizon?

The advancement of drone technology will shine the spotlight on a whole new level of industry innovators who are able to apply that technology to create a workflow that is customer centric and automates wherever possible.

For example, machine learning offers a big leap forward in this regard. Integrating technology like Smartvid.io and BIM 360 into these drone workflows can automate a lot of activity. Their AI engine, VINNIE, can analyze streams of drone imagery, extract important data, and plug it into the construction management platform for further analysis and reporting. It can handle all incoming visual data and accompanying audio, automatically labeling (or tagging) the data based on content, making it easy to search and sort in the future.

Additionally, Smartvid.io SmartTags can detect common safety risks like missing hard hats or gloves, giving teams an extra pair of eyes to help drive a positive safety culture on the project.

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Leading the Charge: PARIC Corporation

PARIC's commitment to its drone program – overviewed throughout this article – is firm, explains Leek, because "PARIC strives to be at the forefront of the latest technology, and Site Scan makes it easy for us to collect and process accurate drone data." He concludes: "With the BIM 360 integration, we can easily share it across our entire project team and with our customers. It will be used on all of our projects."

Construction is a competitive industry, and customers expect more from the firms they choose to do business with – more transparency, more accountability and greater efficiencies than ever before. All that equates to this: construction companies that adopt drone technology now can anticipate being at a clear advantage by experiencing improved project efficiency and, ultimately, greater profits.

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EXPERIENCE. EXCELLENCE.

Ready to Connect Your Workflows to Drone Data?

Enhancing your construction drawings and documents with drone data is an easy way to get started.

With a drone program integrated into your construction management platform, you'll be able to quickly improve:

- Jobsite documentation & QA/QC
- Progress tracking & reporting
- Inspections & overall safety

Connect your jobsite and start delivering faster, cheaper, better, and safer.

GET STARTED

AUTODESK® BIM 360™ + 3DR SITE SCAN

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Construction Management Software for Improved Decision-Making

Make better decisions and eliminate costly delays with BIM 360, the next-generation construction management platform.

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