UAVs in Civil Infrastructure

By Jeremiah Karpowicz

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BUILDING AND INSPECTING STRUCTURES like roads, highways, bridges, tunnels, and railroads is a thankless and taxing job. It’s thankless because the expectations the public has around civil infrastructure systems never take into account the effort that it took to put them together in the first place or the amount of use they endure. It’s taxing because the cracks, rust, corrosion and other maladies that can impact and cause damage to these structures often go unseen, meaning it can take a considerable effort to detect both problems and potential problems.

Drones can monitor such things in an active manner and provide critical info to the people who need to be aware of them. There’s increasing pressure on the public sector as well as private organizations to look more closely at infrastructure, and the potential to inspect bridges and tunnels without lane closures represents an incredible savings in costs while also avoiding angry feedback from a public that has to deal with increased commute times. The potential impact drones can have on public safety in this regard is of even greater importance though. Not too long ago the White House released a report that said 25% of the bridges in the country needed repair or were operating over intended capacity.

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UAVs Increase Safety While Reducing Risk and Lowering Costs

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In the near term, UAVs will save individuals from the dirty, dull and dangerous jobs, while also making the whole process that much safer and more effective. That kind of efficacy is something Michael Cohen has seen as the President of Industrial SkyWorks, a commercial UAV and data solutions company. He understands how drones have changed the approach that professionals can and are taking when it comes to keeping an eye on the stability of these structures.

“The change in frequency around monitoring is precisely the disruption the technology is causing,” said Cohen. “If something is dangerous and costly to look at, but there’s value in...”
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looking at it, you need to be able to reduce those risks and expenses, and that’s precisely what drones are doing for us. Because of those reductions, we can look at things more often. Doing so provides you with better data, and that allows you to make better decisions around infrastructure.”

It’s expensive and sometimes dangerous to send a survey crew to monitor changes that take place over years or even decades, but drones give engineers the ability to gather data from different perspectives in a safer, more efficient manner. These improvements are only going to get better as the market grows and the cost of commercial UAVs come down.

The other major benefit drones can provide relates to the multiple applications that these tools have enabled. Organizations are seeing savings when compared to current personnel and manned aircraft costs, which can then be used by engineers to augment their work as it relates to things like automation and system upgrades. Professionals are going to be able to do more with less, but this change in approach isn’t just about the bottom line.

Changing and Establishing Industry Standards

OUTSIDE OF REGULATORY CONCERNS that vary from one country to the next, one of the biggest challenges civil infrastructure companies are facing is the need to step back and ask some key questions around how they want to utilize these tools. What data do they need? What’s going to be the best sensor/aircraft combination to collect the data? How are they going to process the data? Will that tool or process be able to be integrated into how they’re already handling things like record keeping, maintenance, reporting requirements, and recurring training?

Answering these questions can allow organizations to get specific in terms of what they want, which in turn allows them to explore options that provide them with solutions to meet their specific needs. It’s something that Joseph Betit has seen in his work with UAV systems for private firms, city governments and the US Government.

“One of the things that we’ve looked at closely is real-time video, which we can utilize if we have the right kind of connection,” said Betit. “You can be sitting hundreds of miles away but
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still visualize the situation in a way that’s much more powerful than photos or reports. The ability to communicate with the client and design teams that are at remote locations has already changed dramatically. UAVs are enabling collaboration in an incredible way.

The ability to both collaborate and communicate with teams across the world about info they’re all seeing in real time represents an incredible change. New opportunities are being opened up, but with those opportunities come challenges. Russ Metzler is the director of UAS Services at Asymmetric Technologies, and someone uniquely qualified to talk about those challenges. He has keen insight around the struggles that companies are dealing with, especially as they relate to implementation.

“The biggest barriers right now are around specific markets and industries as they try to look at drones and start to establish industry standards for types of aircraft, training requirements, operating standards, etc.” Metzler said. “We spend a significant amount of time engaging with customers and their safety/risk managers to establish safe operating guidelines and practices, but it would benefit all of us if that was done on a larger, industry basis.”

Being able to look at such logistics from a wider perspective is something that regulation can help establish, but all of those efforts will need to line up with the needs and goals that individual organizations identify. Doing so will allow them to spearhead changes within their own organizations which will in turn help establish those industry standards for the benefit of the entire community.

“The Year of Converting Minds”

FOR A LONG TIME the word “drone” had a negative connotation, and it caused many professionals to shy away from the technology. Until very recently, that hesitation was still very much an issue, as drones had been viewed as solely government focused. However, the discussion of public and private applications and safe use has really shifted perceptions. That mindset changed in a big way in 2015, and the proof of that has been readily apparent.

“I refer to 2015 as ‘the year of converting minds’,” Cohen mentioned. “My conversations with customers and organizations who were vetting the technology completely changed in
In January of 2015, organizations had a typical amount of reservation and regarded the technology as dangerous. By December of that same year, we were getting calls from people asking to get our crews out to inspect something.

Such changes in perception are due to a multitude of factors, the least of which being that there are now plenty of examples and case studies that prove how and why drones have led to safety improvements, which have kept workers out of dangerous conditions. One only has to consider what it takes for a human being to manually inspect something like the underside of a suspension bridge as opposed to sending a drone to document that same information.

It’s become apparent that UAVs aren’t just impacting the type of work humans are doing, but even the personnel that are performing these tasks. Drones have opened up new avenues for workforce development, especially veterans. The majority of the real world experience with the operational application of drones resides in veterans and provides them with an opportunity to leverage their unique skills and work experiences. That includes mission focus, taking care of customers, and underlying safety approach. As a veteran with over ten years of service with operational deployments, Metzler has seen what kind of difference that expertise can make in these real-world situations.

“We supported a power plant customer that had structural failure on a piece of key infrastructure which reduced operations by 1/3,” Metzler continued. “Unable to get a crew in there to inspect and conduct repairs without knowing what the current risks were, we were able to show up on site and conduct an inspection to collect data that was used to assess the situation and allow for repairs to begin.”

A change in the mindset around drones has allowed organizations to explore the technology that has in turn, enabled the creation of new processes. These new processes are opening doors for workers as these jobs relate to the operation, monitoring and inspection of civil infrastructures.

**Unintended Opportunities**

The excitement around drones in most industries doesn’t relate to what’s being done now, but instead what’s going to be done after these tools are more widely adopted. The civil infrastructure industry is no different in this regard. Professionals are already looking forward to seeing drone-enabled cost effective solutions and the flexible collection of large sets of data, but such things are just the beginning.

“Right now, we’re mostly using digital RGB photography with our drones, but these devices can all carry many kinds of sensors,” said Betit. “So the type of reporting that we’ll be able to get in the future as the industry realizes there are sensors that can get them different kinds of attributes is incredible to think about. It’s already happening in different industries, and we’re seeing some incredible advances in data fusion between LiDAR, RGB and multi-channel infrared type sensors.”

That different info enables different opportunities, many of which haven’t even been thought up yet. Engineers and operators in this market are looking to get involved and figure these things out though. UAVs are a technology they understand already, which has enabled them to think through new applications.

For example, there’s already been development around a monitoring process that uses QR codes and sensors to actively and passively monitor the stability of a structure like a bridge.
“Populations are growing and putting a tremendous amount of pressure on infrastructure performance, which has created a dire need for more frequent maintenance, care and inspection work to keep such structures safe and reliable. All of this has created a perfect storm for rapid adoption of drone technology in this market.”

This data is processed by the machines but then passed along to engineers who can focus on interpreting the data, rather than the logistics of gathering it. This kind of progress is directly related to the techniques and technologies that are being developed right now.

“We started with looking at applications that are driven by payloads, and it looks to me like the science of geomatics is really going to promote the adoption of drone technology,” Cohen concluded. “It’ll come at a high level, but the efficacy has been proven which makes the technology inevitable. We’re moving exponentially to increase our capacity, and that capability continues to increase year-over-year. The model of replacing dangerous human activity with small vehicles that are highly capable makes a tremendous amount of sense. We know they’re getting more sophisticated in terms of demanding safer outcomes in the workplace.”

This sort of work is more important than ever, and it relates to more than certain decaying and overused infrastructures. Populations are growing and putting a tremendous amount of pressure on infrastructure performance, which has created a dire need for more frequent maintenance, care and inspection work to keep such structures safe and reliable. All of this has created a perfect storm for rapid adoption of drone technology in this market.

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.
Experts Interviewed for this Report

Joseph Betit recently retired from the Bechtel Corporation as the Corporate Manager of Survey and Innovation. Mr. Betit continues his work in UAV systems, digital project delivery, construction robotics and the development of the new form of heavy construction company networked collaborative construction systems. He has worked for private firms, city governments, the US Government, owned his own practice and taught at three universities. He was a pioneer in the development of distance learning systems delivering ABET accredited geomatics courses to geographically-dispersed students. In addition to his teaching and program coordination roles, he also managed applied research spatial and cartographic information labs.

Michael is an Airline Rated Captain with a Masters in Aeronautical Sciences: Aviation Safety Systems. He is an expert in aircraft safety systems and risk management and is a certified aircraft accident investigator. As a proactive leader with a commitment to safety, Michael has served as Chairman of Air Safety, member of an Occupational Health and Safety Committee and member of an Airline Emergency Response Team. Michael brings project management proficiency, corporate operations experience and dynamic leadership to his role as President of Industrial SkyWorks.

As the Director of UAS Services, Russ is responsible for leveraging Asymmetric Technologies’ core capabilities of Field Service Representatives (FSRs), Training & Advisory, Product Development & Consulting, and Logistics to the emerging public and civil Unmanned Aerial Systems market. He is primarily responsible for the development and implementation of UAS aircrew training and certification, flight planning and operations, maintenance, and safety programs. His operational and technical expertise allows him to breakdown requirements to complex problems and provide unique solutions to our clients’ challenges.

Russ is a veteran with over ten years of service with operational deployments with the US Army as an Infantry Officer and Joint assignments as Strategic Plans Officer. Since leaving the military he has supported rapid acquisition efforts for Department of Defense and the Department of Homeland Security, including the US Army Rapid Equipping Force, the Army Asymmetric Warfare Office, the Joint IED Defeat Organization and the US Army’s Engineer Research and Development Center. Russ is a certified Project Management Professional (PMP) from the Project Management Institute (PMI) and also DAWIA Level II qualified.
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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