

- Sean McGowan: Hello everyone and welcome back to Thompson Coburn LLP's Three Lawyers and a Drone Podcast coming to you from Washington DC. My name is Sean McGowan and I'm a partner in the firm's regulatory practice group and co-chair of the firm's UAS practice group. As always, joining me today are my colleagues, Tyler Black and Mike Deutsch. On our last podcast, we took a look at the use of drones in the commercial photography industry. Today, we turn to exploring the increased use of drones in the construction industry. We are fortunate enough to have Mr. Tomislav Zigo of firm client, Clayco, Incorporated as our guest today. Tomislav is a LEED certified architect with a Certificate of Management and Building Information Modeling. Tomislav is the Vice-President of Virtual Design and Construction with Clayco, Incorporated, a nationwide full-service architectural engineering design, build and construction firm with its main office located in Chicago, Illinois. Tomislav is also a private pilot and is in charge of Clayco's Part 107 Drone and Drone Piloting Program. Tomislav, welcome to the podcast and thank you for taking the time to be here today.
- Tomislav Žigo: Thank you, Sean. Glad to be here.
- Mike Deutsch: Hi, Tomislav. It's Mike Deutsch. Thanks very much for being on the podcast today. Can you tell our listeners, who may not be familiar with Clayco, how large Clayco is? What kind of construction projects the company is typically involved in and where the projects are typically located?
- Tomislav Žigo: Clayco is a real estate developer and design-builder. We are a very complex company that hosts a multitude of organizations that are geared toward delivering the turnkey solutions. Basically, key in hands at the end of the project, from design to construction. Most of our projects are based in the United States. We cover a variety of markets, from institutional, industrial, corporate, residential. Clayco has been in business for almost 40 years And is roughly a 2,000 people company while last year's annual revenue was close to \$2.8 billion dollars.
- Mike Deutsch: Wow! So it certainly sounds like quite a large operation and I'm thinking that technology and safety have evolved significantly since the – since the company's original inception in 1984. Is that – Am I correct in that?

Tomislav Žigo: Absolutely. And listen, the entire industry has evolved technologically and Clayco has incorporated some of those advancements that were conceived almost 40 years ago in other industries. Codes and regulations change all the time, schedules are shorter and buildings are more complex. We are dealing with new materials, new technologies, new constructual obligations and safety is paramount of our practice. Basically, the emphasis on safety is what drives this company forward and the differentiate this company in the market.

Mike Deutsch: Right. Right. Now how has aerial photography specifically evolved since Clayco started business?

Tomislav Žigo: Well, aerial photography was present in our business for quite some time, you know, from obtaining aerial imagery, from planes and satellites. We always try to determine the context and location of our projects. Up until probably 5 years ago, it took a lot of data wrangling, if you will, to obtain up-to-date photos, satellite photos were prohibitively expensive maybe 10 – 15 years ago. And, there was an obvious need for most current up-to-date information. That changed drastically, the introduction of online services like Google, Google Maps, Google Earth. However even those were not really keeping up to speed with the basic construction and obtaining high quality images was relatively expensive. Renting a plane for a day or a helicopter each time you need a photo, has its price tag. We can pinpoint a number advantages when it comes to using drones, but needless to say, democratization of drones and UAVs in this industry is a game changer – the change when it comes to obtaining most up-to-date images.

Mike Deutsch: Yeah, absolutely. Now, when did Clayco first start using drones on construction sites?

Tomislav Žigo: We started to dabble when it comes to using drones in mid-2014. We were looking into implementing drones on our complex healthcare projects. We decided to look into the development of this technology by attending different conferences, reaching out to companies that started to emerge in this market. By the end of 2014 we were purchasing first drones and trying to understand: how can we align this new technology with specifics of the construction process.

Mike Deutsch: Now, fast-forwarding to today, about how often do you use drones on Clayco Construction sites?

Tomislav Žigo: Well, the adoption was really skyrocketing over the last few years. I'm happy to say that there's no Clayco job site that does not utilize drones unless that's specifically prohibited by the client or by the location. So, I would say, we have 100% adoption of this technology across Clayco job sites.

Tyler Black: Hi Tomislav, this is Tyler Black. Can you tell us a little bit about some of the benefits that drones provide you as an architect-engineer and builder?

Tomislav Žigo: I would say the big picture answer would be using UAVs or aerial photography that is carried out by drones really offers a deeper insight into what we do. But, I also like to delineate this into internal and external use. We really like to communicate and follow up processes to maintain a clear line of communication and informing our clients or our partners about the job site progress, about conditions of the site or any potential issues. So, drones offer an unprecedented dose of clarity, for everybody that is somehow associated to the job site and then, when it comes to internal use we are definitely trying to delineate this between the design process used and the construction process use. Would you like me to elaborate on it a little bit more?

Tyler Black: Yeah, can you dig into that a little bit? I think that's really interesting.

Tomislav Žigo: So, if you're looking at an owner's use, first of all I think just the notion that we can be posting very interesting point of view of our jobs literally twice a day if we want to and upload those videos into the data stream and share this with the client assures our clients that Clayco is about delivering the project in a very transparent way. It also allows clients to interact and be proactive if there are changes to design that needs to be made or if there are any other concerns that clients can share with us practically. The other aspect from client's perspective, is that we often offer service of surveying the property and informing the client or giving the client additional perspectives on their property by deploying UAVs. Marketing is also a large component of our drone use. And to be honest, this is an on-demand service. If the client requires a different perspective, different kind of video, different kind of information – this is something that we can offer without necessarily mobilizing additional resources because we are empowering all of our job sites to have the technology ready. When it comes to internal use of drones, as I said we are dividing this in a design and construction domain.

Design domain definitely benefits from use of aerial photography and the reconstructing or extracting three-dimensional information through the photogrammetry thus providing context for a future design. If you are a client or a designer working on the project you really would like to understand how does your building in its scale, type and the appearance fit within the context of an existing site. Once you have obtained this information if you are really, really early on in the process one of the most useful applications of drone technology is extracting topography and have an additional layer of understanding what your site is all about. Needless to say this process is far faster than typical surveying process that can take days on a large construction site.

When it comes to construction pictures are a little more complex. Obviously we are using aerial photography to monitor the progress of our jobs. Not only for the client's benefit but also for managerial benefit, if you will, that really happens on a daily basis. All of our project executives, project managers, can tune in, at any given point, into our project dashboard and understand where the site is or where the job is at any given point. Another interesting aspect of our utilization of drones is really

documenting things that will become obscured as building or construction progresses.

So documenting everything that goes in the ground before building foundation is being poured, or building slabs are being poured, this applies to all the underground utilities or monitoring the quality of execution of those underground utilities. This assures that digging a trench and laying the pipe actually reflects what was being delivered on the construction documents, and it has a huge benefit not only for us as a contractor, but also for a client giving them by basically an accurate as-built information at the close-out of a project. And then, there is the aspect of safety. Monitoring job sites, monitoring the perimeter of the job site, being able to inspect elements of the project where sending somebody in a hoist or sending somebody up high to inspect buildings that can be visually inspected by good visual sensor eliminates putting people at risk. So most of our drone operations really relies around quality and safety at the construction site.

Tyler Black: And I'm curious from what you've been talking about just now, have you noticed or seen that customers are coming to expect the use and advantages of this kind of technology from a sophisticated company like Clayco? Are you observing that? That customers will come to you and kind of expect that you're gonna use drones or – or not be surprised when you say, hey that there's an advantage here if we survey this with a drone?

Tomislav Žigo: That's an interesting question. I would say 2 or 3 years ago because of all the hype in the market, we were getting those questions. You know, are we using drones? Obviously, it was to our advantage to say yes. Clayco is really investing in this technology. I would say over the last 2 years the clients that we are working on are sophisticated enough to just assume that this is a part of our tool kit. I don't think we are getting these questions anymore, but clients just expect the use of drones and as a matter of fact to have access to this information. So, it's not anymore a bragging point to say we fly the drones. It's just part of a tool kit. and what really drives our adoption now is the desire to differentiate in terms of how we're delivering the drone data, how we are analyzing the drone data and ultimately how to distribute the drone data to our clients and – and to all stakeholders that are on a project.

Tyler Black: Right. Okay. So then it sounds like you're saying that definitely the value of the information that you're getting from using drones outweighs the cost of operating them?

Tomislav Žigo: Oh, absolutely. And, and especially since we started to transition the use of drones would be solely internally driven operations, we are driving the cost of deploying drones really down and obviously, technology is evolving so rapidly that today, \$2,000 drone can do so much more than a drone that was \$10,000, \$15,000 or \$20,000 just 4 years ago.

Sean McGowan: Interesting. Tomislav, it's Sean again. I'm just wondering about that transition that you were just mentioning.

Tomislav Žigo: Mmm-hmm.

Sean McGowan: And it's probably a good time to get into how and where is Clayco obtaining drones and pilots now versus I think you mentioned that in the future you're looking at taking it in-house. But what are you doing now?

Tomislav Žigo: It's a combination of – of resources that we are deploying. Right now Clayco is going through the process where we are outsourcing flying aspects of this business to people that have certificates in the areas that we operate. And, that works really well for us. So basically, data gathering is done following Clayco standards and Clayco safety practices. Obviously, not only safety, but also following Clayco insurance requirements, however the data processing is happening on Clayco end. Right now we are in the process of transitioning from this model and we were fortunate enough to bring people on board that are great, instructors who both are conveying practical knowledge of flying drones and also conveying FAA required knowledge in order to obtain the license, so we are going through the process of internal training and literally onboarding our superintendents, project engineers to be capable to plan and executive the missions and obviously upload and analyze the data.

Clayco was fortunate enough to work with people that represented a vanguard of drone industry that put us on the path toward obtaining our FAA exemption the first and famous 333, very early on. We were the first company in the country that was allowed to fly drones on our construction sites and then we really understood that close adherence to FAA regulations, monitoring insurance requirements and really being connected to all the legal aspects of flying is only to our benefit. So I would say that created an atmosphere and the need to create very robust and sustainable UAV operations at Clayco.

Sean McGowan: Okay. So, and – are there, are there other benefits to taking it in-house as I see, you know, the compliance obviously, you have better control on that. Are there other things that you're thinking will be beneficial to having all that under one roof as opposed to third parties?

Tomislav Žigo: Well obviously they're driving the cost down. The other one is, I think, that allows us to even further strengthen our safety attitude when it comes to utilization of UAVs. And I would say the third and not a tangible benefit is we tend to pride ourselves in being innovators across the organization. I think giving the equipment, meaning means and methods, in the hands of our people that are using the drones is only going to lead us to discover the new uses of technology. Some of those are emerging right now and, , I will be happy to follow up with you in a few months from now and see how they're doing in that regard.

Sean McGowan: Sure. Okay, so if I heard you right, you're in the process of gathering people in-house that are going to be certificated in flying. Do you have

any kind of ideas like how much that is costing Clayco? Because you mention that cost – cost was a driver of coming back in-house.

Tomislav Žigo: Well, if I need to kind of wrangle this entire training program and you know, deploying the drone on the job site. I would say, having drones deployed at a job site probably runs anywhere from \$8,000 to \$10,000 per project every year. Which, in all estimates, it's a negligible cost comparing to benefits you are getting. And then, there is some benefit of just having an educated workforce that actually understands the tool and the final product. Considering that we are doing training in-house with our in-house personnel, basically this is the cost of doing business with Clayco.

Sean McGowan: Okay. And for the listeners out there that might be thinking that, you know, this is something that we need to get involved in order to make our architecture engineering building business competitive, you know, what have you learned over the last couple of years as you're working with third parties, but now also taking it back in-house or about to take it back in-house. Any kind of tidbits that you can give listeners in best practices or things that they should consider whether, you know, that'd be about what type of drone and, you know, how to go about figuring that out.

Tomislav Žigo: Yeah. I'll, I'll be, I'll be happy to share our insight. I think the most important thing to consider is how to align the desire to bring new technology like drones with an existing business model. How do you proliferate this technology within an organization, whether it's a smaller organization or a larger organization it doesn't matter. I think one is to involve as many people as possible and democratize this technology in a way that you don't have to mystify what drones are all about. Make information available to everybody across the board, because feedback is going to be much better and again, people can recognize where can they use this technology, much more clearly if you have multiple people being involved with the process.

When it comes to equipment, it's kind of interesting these days, I think if you asked me 4 years ago, it would have been a much harder choice. Obviously there is a consolidation in the market, there's a dominant drone supplier or manufacturer which, you know, I – I don't want to put a plug in for anybody, but DJI is the force to reckon with, that are providing affordable and quite capable units. So, our – our goal now is to further reduce the actual size of the unit and make it into something that can be regarded as a hand-held tool. So, little Sparks or Mavics are ideal for what we are trying to do. We are not in the business of high-end photography or carrying or flying the complex cameras and complex sensors. For that purpose, we have a couple of drones that are a little bit larger that can have a more substantial payload. But for all the practical purposes our goal is to make technology accessible and buy the units that are relatively small in size so then nobody can complain about carrying a big pelican case and assembling the drone on-site. We want them to be deployed readily.

The other aspect of in-house drone program is quality control over data, ability to recognize which software in the market delivers results that are needed for a specific purpose, and then assuring consistency is probably the biggest challenge. So, there's the reason why we really wanted to have this process to be a fairly gradual, and it starts with a group that was keenly interested in flying, showing or showcasing the results, distributing those results to people that might be interested and soliciting their feedback. This allowed us to build up their interest within the organization in order to get more pilots and purchase more equipment.

Mike Deutsch: Now just taking a step back and looking at the big picture of drone usage, there's a recent Goldman Sachs report that discusses the various industries that will benefit from the use of drones and one such industry is construction. And the report forecasts a hundred billion dollar market opportunity for drone use over the next 5 years. Where do you see drone use on Clayco Construction sites going in the next 5 – 10 years? What new types of functions will drones perform? Will there be an increase? Do you think it's going to kind of level off? What are your thoughts?

Tomislav Žigo: Well, the – the hundred billion dollars is quite intriguing and I think there are numerous ways to speculate about whether this is really going to become reality in the years to come. I would limit my answer to the insights I gained within Clayco and our inhouse established UAV operation. I think, you know, just to say that we are flying on every construction site, means that at some point our operation, or our deployment, or our frequency of use will taper off. And, what I can see right now is potentially leaning towards units that can spend more time in the air and sensors that are more versatile or sensors that are giving us insight into our jobs that transcends just a visual information. And a greater autonomy for drones in terms of either mission planning or obstacle detection.

So, in a nutshell, I think this is just going to become another tool in the contractor's tool kit. the results are going to get better – I think we are really shifting focus toward better analysis in terms of software and data distribution. One of the drawbacks of using this technology is a vast amount of data that now actually flows through our data pipeline. So optimizing that delivery, relying on cloud platforms and creating a more collaborative environment where multiple stake holders can review, data output by a drone is our priority. Not necessarily drone technology per se.

Sean McGowan: Okay. Well, those are all great and very interesting insights, Tomislav. Appreciate that. I definitely agree with you on one. I guess one of the big issues being, you know, time in the air. I think a lot of people are looking for how can they maximize that and will be over the next couple of years too. are there any other questions or comments from Mike, Tyler, Tomislav, anybody?

Tomislav Žigo: Sure. And if I can just wrap it up, I would just say if – for construction companies that didn't get a chance to get their feet wet and, and plan start using UAVs as part of their process...this is a great time to start.

Technology is affordable, software is mature and there is less confusion in the market. So, I think the answer that we would be getting to people that are delivering this technology is far more straightforward and far more realistic.

Sean McGowan: Well, that's great. Excellent. Again, thanks Tomislav for being with us today. Lots of great information and insights, values of drones in the construction industry. We definitely appreciate it.

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