

The Rational Optimist Podcast

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Stephen McBride: So Thayne, I know you're a licensed pilot. I'm always obsessed with what happens when something goes wrong in the cockpit. You have any scary stories, any moments in the air where you're like, "oh shit."

Thayne Kollmorgen: Yeah, I think actually the three times that I've almost killed myself were probably all in planes. I had one time, this was all coming across the Cascades, so I used to live in Idaho and I had a small plane with a group of friends and I would fly over to visit my family in Oregon. And so one time over the Cascades, I don't know why, but the engine just started going like, it just wasn't running well.

So I was like, "uh-oh, this isn't good." So the first thing that goes through your mind is like, "okay, where am I going to land? Like if this thing actually craps out, where am I going to set it down?" And it was, again, it was over the cascades. So this is like not really a whole lot of areas, just trees and mountains. But I did see a forest road. So I was like, "okay, that's probably my best bet. It's not going to be a good one, but at least it's a road, not nothing."

And then after that, you kind of just, I mean, they teach you in flight school, have, there's some things that are more likely that you should check first, and you go through check those. And I think what happened is I was descending and when you descend and you're reducing the throttle, you can get a carb heat—or, excuse me, carb ice that'll build up and that will basically block air from going through the carb and then choke the engine out. So the first thing I did was just turn carb heat on and that seemed to solve it. Carb heat on, mixture-rich, and that seemed to solve it. So that was, that was fine.

The other one that was probably more scary was I was in Bend. It was high-density altitude. We had got there in the morning, so it was colder. But then in the afternoon, you know, it's a high airport. It's hot. And so the density altitude goes way up. And we were just in like a little Cessna. So it's not super powerful. And my buddy wanted to... This is like right after I got my license and we had the whole thing was like packed with ski gear. And my buddy wanted to like go up with us. He lives in Bend. So I'll take you up for like a quick, you know, just we'll fly around.

And we took off, and it just like after takeoff, it just wouldn't climb. It was basically just kind of like putzing along. Again, you just kind of go back to your training. The thing that you... The instant reaction that you want to do is like pull up and try and climb more. But that would just get you into a stall. So training just says just keep the speed that you're supposed to have. Eventually something will happen.

And so we, yeah, I just basically kept it pitched at the same angle. And eventually I think we caught like an updraft and it just boosted us up. And then from there we were able to keep going, but that density altitude thing will definitely, that'll get you for sure, if you have an under-powered plane.

Stephen McBride: Back to your first scary moment. I know you're in the drone industry building drones, American-made drones. Is there anything that you can learn from like the altitude or the freezing of the motors or anything like that and apply it to drones? Cause I know Augustus over at Rainmaker is talking about how a lot of the drones—they fly them up high altitude or into clouds and they kind of don't work.

Thayne Kollmorgen: Yeah, yeah, it definitely happens. Icing is probably one of the things as I mean, his use case is very prescient because they obviously get into ice flying in the clouds. And the Pacific Northwest, especially, it's just a one of the worst places for icing that you can be in. So yeah, I mean, you, just want to stay, you generally have to stay out of the clouds unless you're licensed to go do it anyway. So that comes into play.

But even if you're taking off and like, maybe the mission is cold. I've had missions I've flown in farm fields where, you know, it's like, where it's like five below. It's like super cold. So you just got to make sure you don't have ice on your props that they don't form because that obviously ruin the airflow. And then you don't have a lift and the drone doesn't get borne. So there's some similarities like that. And then I would say also just like the mentality has to be similar. If something goes wrong, you got to go through your, through the checklist in your head and just kind of try and troubleshoot really quickly.

Stephen McBride: Who makes the best drones in the world today?

Thayne Kollmorgen: It's hands down DJI. There's no one that's even close really. If we're talking about that segment, I mean, drone is such a big word. But yeah, in the small UAS space, under 55 pounds, they're the 800-pound gorilla, no doubt.

Stephen McBride: Before we get into DJI, what separates a good drone from a bad drone? Because the amateur looking at it says, "I just see a piece of plastic, a quadcopter basically. How is the one I pull off the shelf at Walmart or the one America—a lot of American manufacturers make, how is that different than what DJI makes?"

Thayne Kollmorgen: Yeah, I think the two biggest things, and there's a bunch of things that kind of fall under each of these categories, but the two biggest things are, one, reliability. You know, when you go use it, it's going to work the way that you expect. You're not going to have like a fly away or it's not going to have like some problem connecting or it's not going to fall apart or, you know, just rattle itself into pieces. So reliability is super important.

And then the second is I would call it like operator-first design. There are so many things that you can do in your design that either make the operator's experience fantastic when they go use it. It's the op, but the flow of operations is smooth and just a joy to go fly. You're not like fighting the system on the opposite side.

There's a bunch of things that you can do to mess that up. And it basically makes the operator's day hell because every time they use it, there's this one, you know, way that the drone manufacturer designed it and they just have to like fight that lack of good design every time they use it and then it just becomes a hated product.

So that operator-first design is a make or break. It'll make people absolutely love your product like in the case of DJI because they've done a good job with that or it'll make people just like loathe the thing. So those are probably the two biggest things.

Stephen McBride: Is that a software or a hardware problem or both?

Thayne Kollmorgen: It's both. Yeah, there's you. It's not really separable there. You got to you got to do good design on both fronts.

Stephen McBride: So how dominant is DJI in the drone industry? Then just to give you a... You know, it's hard to put a number on it, but how better is it than the best US technology today?

Thayne Kollmorgen: It's... So they're extremely dominant. I think the stat's a few years old, but they own something like 90% of the US market in that small UAS category. So they're preeminent. And then in terms of how much better, I mean, there are some manufacturers that are starting to get close. But I'd stay it's still probably an order of magnitude. Like, at least and then... and that's just against the top players.

Against some of the other players, like, you know, there's a whole bunch of drone companies out there against some of the other ones. It's just like, I don't know, they're probably like five or 10 years behind easily. Just if you look at like what DJI built in their product line, you look at the history of it, the feature set and the quality and the operator-first design that DJI has is at least 10, five to 10 years past what other drone companies had.

Stephen McBride: And that five-to-10-year gap, what does that mean in practical terms? Maybe someone might understand, “hey, a Tesla from today goes 300 kilometers an hour or whatever versus one five or 10 years ago went 200 or 150.” Is there any metrics, hard metrics that say, hey, this is what that five-to-10-year gap means in drones?

Thayne Kollmorgen: Yeah, I would say there's a range of things. So it's hard to really pin down to one thing exclusively, but something as simple as like folding arms. There are drone manufacturers out there who are still coming out with models that don't have drone arms that fold.

And that's like kind of a big deal, right? Because it's like when you're, again, going back to that operator-first design, the guy has to lug a case around every time they use it. So if your arms don't fold, that makes the case bigger. That makes that lugging around thing more of a pain.

I was with a customer the other day and I was demoing our system and you we have this big case because I had two drones in it and so it's fairly large case. That was the first thing he noticed. He's like, “whoa, that case is huge. That's not the thing I'm lugging around, right?” I was like, “no, no, no, don't worry. This is...I have two drones in here.” It's not like... We're not... This is not the case we're shipping with, but like that's something that people instantly noticed.

The other thing would be like the software. The software is built in mind with the payload that you're going to use. So when you attach the payload in a DJI system, the ground control software knows that that payload is attached. The UI has actually changed to accommodate that software.

There's like buttons and features and sliders and everything that are associated with that payload. DJI didn't have that on the S100 or the, I forget the other like big hex copter drone that they had a while back, I think it was like the Matrice, one of the earlier Matrices. That thing, it was just, it just provided power.

There was no like, that's how a lot of drones are now too. It just provides power and then the payload hangs off there. It does what it does. But the software isn't talking to the payload. Sometimes you can't even see the video feed through the payload.

So I think drone manufacturers in the US are getting better at that. But since a lot of them don't make their own payloads, it's not as a tight, tight integration that you would want. And then usually there's like an integration that you have to do. You have to go into some GUI and say, “okay, yeah, like you know, here I got to change the IP address here to make it work with this.”

And for operators, that's like, "I don't want to do that." If I have a fleet of 50 drones, now I have to go do that 50 times. If you're a UAS manager, that's actually the person who usually does it because the techs who are flying usually aren't as tech-savvy. And so now it just makes the UAS manager's job a headache to have to do that 50 times or whatever it's going to be.

So those are all features that, you know, DJI didn't have before, but they've created now, but are still lacking for a lot of the US guys.

Stephen McBride: Why is America so far behind on drones?

Thayne Kollmorgen: Man, another just big, big question. I think that there's several reasons. I mean, there's obviously the, like, I think, the first and foremost one is I actually just think that we haven't done a good job doing the product management side of it. I know that sounds silly, but like, you'll be shocked. Even some of the top players, they'll release a drone that's just like missing some things that you were like, "why did the product manager not put this in the PRD? Like, this is like a thing that would have been obvious."

Like there's a dock out there. It's a super expensive dock, \$180,000 dock. It doesn't recharge batteries. And then the customers are like, "Hey, like, does this thing do battery charging?" They're like, "no, but you can buy another dock." It's like, well, what kind of answer is that? I paid 180 grand and it doesn't do that. Whereas DJI's dock is like 30 grand and it does that.

So, you know, there's stuff like that where I just think the people who have been building drones—almost none of them have been operators. And they just haven't done a good job designing their drone for the operator.

And then DJI also has this like very founder-driven model. I'm forgetting his first name, but, Mr. Wang, the guy who runs DJI is like... He's like an obsessive. I've heard that he has, he has a massive table in his office. It's, huge. It's like, I don't know, 40 feet long. It has a little pullout where he sleeps. He'll like sleep in his table. And he's got all of his plans for everything on the whole thing.

So he's just like totally obsessed with the product. And so that's why you end up with a really good one. So anyway, that's all just like around product design and being operator-first.

The other reason, there's a bunch of structural reasons. China has dominated the electronics industry now for a really long time. So they have that whole ecosystem of manufacturing that I think is, you know, plenty of people have realized that and have

talked about that extensively. And that affects a whole bunch of different products, but it definitely affects drones as well.

I'd say those are the two things, like structurally China is just much better set up to build this type of thing. And then, two, the company that they've—the pre-eminent company DJI is run by a guy who's just obsessed with the problem and lives it breeds it like 24 seven.

Stephen McBride: Besides the product management side of things, is there a single biggest problem that America has to fix to become dominant in drones or at least on par with China? Or is it just this whole bunch of things that needs to be sorted out?

Thayne Kollmorgen: I think it's a handful of things. We definitely need to solve the structural issue to help make manufacturing stuff here easier. I like to manufacture that type of product. That would obviously go a long way, because that would drive the price down, which is important. I honestly think the, you know, I always feel like that's kind of a cope.

Like most drone manufacturers, when I hear them talk about the problem, like, “we don't make motors, or we don't have like, you know, we can't make batteries here or whatever. They have a Shenzhen and we have Silicon Valley, So we're good at software. They're good at hardware.

I feel like that's kind of like it's true, but it's also kind of a cope because it's like, okay, but there are companies here that received millions of dollars. They have made products now for 10 years, and they still just produce a product that's not very good. And that's just like a design philosophy problem. They have built the drone. They just didn't build it right. I honestly think it's more that and you know,

US companies, they're sensitive to price, obviously. So they don't want a drone that costs like a ton, but like they also will expect that if it's made in America, it's going to be more expensive. I mean, the people we're jumping for, they're like, “look, charge for you need a charge for the drone. just, need one that works. Like our operation is complicated. There's a lot of things that can go wrong. We have to have a well-designed drone that's reliable. Like that just has to work.”

And so people, they'll swallow the price as long as it's not exorbitant, but they want the drone to be built right. There's just...people just aren't doing that.

Stephen McBride: You're in the drone making business, what is the hardest thing about building a drone?

Thayne Kollmorgen: I think this will be a little bit of a counter to answer, but I think actually it's this open-source honey trap. That's kind how we think about it. There is a huge like gravity to just use like open-source stuff. Like, there's the open source, pick talk hardware. can just, I can go use that. don't have to create my own board. That one's fine. It'll work. Or, Hey, there's an open-source autopilot. There's an open-source ground control system. Like those are all there. I won't rebuild that stack. I'll just use that.

So there's this huge pull and temptation to do that. But I think that just sets you up for failure because once you go down that road, you start going down to end up in a place where it becomes very hard to make the thing operator-first now because you're, you're using all of these tools that are these like very generalist tools and then produce it just like kind of a crappier designed product. And so you never can get to the quality.

So I think actually it's... I mean, there's going to be, are obviously a lot of things that will be difficult about actually building it, but I think the temptation to use the open source and go that route is actually the biggest thing that kills most people.

Stephen McBride: Do you think someone needs to use something like Replit to build a whole new closed source coding ecosystem for drones or like how is that actually gonna get sorted out?

Thayne Kollmorgen: Yeah, that's exactly what I think. That's basically what we're doing. We're trying to build as much of the... We ultimately want to build as much of the whole stack as we can because I think if you want to, if you want to end up with a really nice drone that is reliable and has all the things that we talked about, then I think you have to of have to do it yourself and you can't get, get stuck in the open-source world.

So yeah, we're, we're going to do that. We're starting with the software first, software and the drone frame and some other bits and pieces there. But yeah, long-term, we want to just keep bringing the stack in-house.

Stephen McBride: It seems like America is not going to beat DJI and other Chinese drone manufacturers on scale or at least, you're not going to win at their playing their game. So how does America beat DJI or how do you build the American DJI?

Thayne Kollmorgen: Actually counterintuitively, I think you kind of have to play their game.

Stephen McBride: Interesting.

Thayne Kollmorgen: They are the benchmark. That's what everyone expects. Everyone's been using them now for, you know, depends on the player, but several years. They've come to expect that. So for us, we're starting with the drone size that,

you know, it does have a higher price tag, even from DJI standpoint, it's a more expensive system. And we're doing that on purpose, kind of like what Tesla did where they made the expensive car first before they got to scale.

So we're not even going to attempt to make a smaller drone until we can make it for under 10 grand. Because if you can't make it for under 10 grand, like a Mavic sized drone, people are just like, "I don't want this. It's too expensive for me. So why would I do that? I'm used to a Mavic that costs anywhere from five to seven grand."

So I think what you have to do is start with models that you can build at low scale first. Do a really good job make it as close to DJI as possible. Maybe even improve There's some areas where you can improve over DJI especially on the like... Well, there's like this whole customer service and making sure the drones running aspect that I think also a lot of drone companies mess up.

So it's not just that part but like the processes around the product are important. So anyway start there with low scale and then only when you're ready do models that you can actually produce for a price that people will accept.

Stephen McBride: Is there a way to categorize different drone sizes today? Like is there grade one, grade two, grade three? I think maybe a lot of people have seen the small FPV drones from Ukraine and then on the other side, maybe the giant Reaper drones from, you know, 15, 20 years ago in Iraq and Afghanistan. Just talk to me about like the different sizes, different types of drones, their use cases.

Thayne Kollmorgen: Yeah, totally. So there's a couple of ways to do it. The US military has like this group drone group sizing system. So there's group one, two, three, four, I think there's group five as well. But group one is basically like the small drones that you would expect. And even like the, the sort of larger small UAS that we're building. So I think it's anything under 100 pounds. I might get that slightly wrong. Group two is like 200 to 300 group three, and so on and so forth.

So all the upper groups, I would say, are all very military-oriented at this point, with the exception of some of the delivery drones that are kind of like in the larger group two and three size. And their use cases are like recon, actual like offense if you're going to like have missiles on it and strike something. ISR, stuff like that. All those kind of military use cases.

And then once you get to group one, I think it splits. Then you're in like small UAS territory, which is like anything under 55 pounds. Within small UAS category, there's like large, small UAS, small, all small UAS, you know, medium, so on and so forth. So it's like, it becomes this double word. But within that category, if you're looking at some of the larger drones within the small UAS category, they're primarily being used for LIDAR

right now, for like larger LIDARs, specifically like bathymetric gliders if you wanted to penetrate water and kind of basically see what the topography underwater looks like.

So that's probably the biggest use cases. A couple other niche exquisite ones, like people mount these, they hold these like glycol balls and therefore doing prescriptive burns to have this hopper with a bunch of these balls. It almost looks like a paintball gun kind of thing. And these little balls will fall out. They'll catch on fire and then start a fire. So just kind of like LIDAR and niche heavy lift stuff there.

The medium size, which is what we're building in, I think is probably the most Swiss Army knife of them all, because you can pretty much do everything that you could think of in that size. People do inspections with them. They will do mapping with them. They'll do LIDAR with them. There's also all these like exquisite random niche things that you can do with them. So it's really a Swiss Army knife. It can do a whole bunch of stuff.

Small and below, usually the drone is built with one payload only. And so it's built for a specific use case. Like there are ones for mapping. There are ones for inspection. There are ones for like search and rescue, so on and so forth. And then FPV ones, from what I've seen there, it's mostly just like, there's the FPV ones for people having fun, like, you know, flying around and doing stuff. And then there's FPV ones to, you know, go blow, blow shit up basically. So that's kind of how I'd see it.

Stephen McBride: We've talked about America being behind on actual making the drones. What about the counter drone systems? Where is America in that? Because it seems like we have kind of we have the electronic warfare. You have anti-drone turrets. You have anti-drone lasers. Is America as far behind in the counter drone stuff as it is in actual drones?

Thayne Kollmorgen: You know, to be honest, I'm actually not as knowledgeable about that market. I don't know it as well. So you know, take everything I'm saying with a bit of a grain of salt. I actually think we're doing pretty good there. There's a whole bunch of startups on that. They're attacking it from multiple different angles. And I think, some of them are really good.

Like Dedrone comes up that they've done very well. They have kind of an array of different systems where they both do detection and then also mitigation. There's all of the guys who are kind of have like the automated turrets and everything. They're actually... I think we're, I think the whole Dedrone thing—or excuse me, the anti-drone stuff is also a younger industry as it is. It hasn't been around as long as the drone industry itself.

So there I actually think we're doing pretty good because it's younger. There's a bunch of people hopping on it. Everyone always is the problem. There have been people

who... who have been making stuff in that space for a while. Like one company, Echodyne, they make a small little radar. It was originally actually gonna be something on the drone to do detect and avoid. So if you had like beyond visual line of sight operations, they had this small radar you could put on the drone and then the drone can avoid aircraft and stuff.

They were a little early for that, because there just wasn't that much beyond visual line of sight stuff happening. So they kind of pivoted to more like, hey, we'll have these turrets and it'll look for people at like, border crossings or basically detect people where they shouldn't be. But now they're also kind of getting back into the drones and they've been around for a very long time as a spin out for from Intellectual Ventures that arm up in Seattle. I think the anti-drone stuff we're actually doing pretty well. That would be my take.

Stephen McBride: You mentioned beyond visual line of sight. It seems like one of the other big things holding the American drone industry back has been regulation...has been this beyond visual line of sight stuff. I believe we're now at the stage of issuing exemptions and waivers to certain companies. Where are we on the regulation stuff? Do you think beyond visual line of sight has gone what would our regulations are holding the drone industry back?

Thayne Kollmorgen: Yeah, I think so. I agree with you. I that's about to open up really big with part 108. So part 108 is a whole new set of operating rules that are, it's basically specifically designed to enable beyond visual line of sight. And I think the people that's really going to open a lot of possibilities for are all the drone delivery companies. So like, you know, Walmart, Amazon, Primera. I'm blanking on the other one. It's actually ahead of everybody.

Stephen McBride: Zipline.

Thayne Kollmorgen: Zipline. Yes. Thank you. So yeah, you know, I think that's about to open up that, that use case, there's other use cases that are more related towards what we're doing that will also be enabled by that. So that'll be really helpful. Before it was like, I mean, prior to 108 coming out, it was very difficult.

But very early on in the exemption process, there just no one had, there were no rules. Like people didn't know how we even write an exemption. So that kind of progressed and the exemption process, I think is a little bit more clear so people can get them now. Part 108 is going to make it just much, much better.

Stephen McBride: If you could wave a magic wand and change one thing about drone regulations tomorrow, do you think 108 is pretty perfect or what else would you change?

Thayne Kollmorgen: I actually think a lot of it would be less on the drone operation side and more about getting rid of regulations that help us build the type of manufacturing ecosystem here. Like that's gonna be really the bigger thing. Cause you know, people have found within the rules now, they found plenty of use cases for operating. I mean, everyone's operating here. They just use DJI.

So the operating side I think is on track to be good. Part 108 is a good thing. But I think, you know, we need to be able to make all of the inputs that go into a drone here. So there's a ton of deregulation that needs to happen across the board. There's like labor deregulation. I mean, cost of labor here is super expensive. There's, I don't know, this is part kind of an economics question, but there's a whole reasons why our labor costs are way expensive.

There's a whole bunch of environmental stuff that prevents us from building things, whether that's factories getting built or whether that's like processing of rare earths. we just like, can't do that, for these, environmental reasons. I talked to a guy who, who he's doing a lot of PCB store, PCB board stuff.

And he's like, yeah, it's just like the regulations here basically make it so we can't make PCB boards in the volumes that we need, so like that needs to be changed. We should be able to make PCB boards here and not have to rely on China for that. So I think more of the regulation needs to be taken care of at that side of the spectrum than operating itself.

Stephen McBride: If you were to rip apart one of your drones, there one component that's hardest to source domestically? You mentioned the boards, or is it just kind of like, there's 50 parts and like 40 of them are, you know, China dominates.

Thayne Kollmorgen: Yeah, I mean, there's a lot that China dominates. I would say props like there's just the vast majority of props are coming from China. There's a few companies in Europe who are doing it, but they're like four times as expensive. I can buy the props I need for like 50 bucks from China, but you go to the European company and it's like 250 bucks for the same prop. So that's one.

Batteries obviously is a big one. We've been able to get batteries and there are companies in the US now who are doing a better job at that. Ethan over at Ourois is doing a great job. they're a good example. Material is doing 3D-printed batteries. They're kind of early, but that's going to be really cool. Gabe Elias over there, he's in Miami. So the battery thing, I think, is trending in a positive direction.

Motors are difficult. The motor company that we've gone with, they don't do their manufacturing here. They do it in Turkey. And they've got really long lead times right now because everyone needs motors. So it's kind of across the board, honestly.

Stephen McBride: We've talked about America and China so far. Maybe Ukraine is the obvious answer here. Is there another country that really gets drones and that is kind of like, is it ahead of America and catching up to China?

Thayne Kollmorgen: You know, it depends. It depends on which, you know, there was all those sizes that we talked about earlier. So it depends on which size and which use case, but I actually think Germany is doing a really good job.

So you have quantum systems out of Germany and they've done, they're doing really good. They, you know, they originally made kind of like a VTOL. They have several different models now. They don't have a quad. They're missing that. But as far as like, the fixed-wing kind of larger ISR and military stuff, I think they're doing a pretty darn good job.

But if you're talking about like quads, mean, China just still dominates it. And most of the other countries, you when you go and look who's making all the components, it's like still Chinese motors and Chinese stuff. So they're just using the components and kind of like designing a frame around them. So China definitely still dominates.

Stephen McBride: It's like the old meme of the astronaut with the gun to the head. China makes all the drones, always has been. Even for Ukraine. Even for Ukraine. What's the most underrated trend in drones right now, do you think?

Thayne Kollmorgen: One that I see, I don't see a lot of people talking about is the... There's a big trend right now, especially in the commercial space going, where the model was very service provider oriented to actually just the companies having their own fleets in-house. And I think that's gonna, that's going to be a big trend. Because once they, once a company gets it in house, they're like, "okay, great. Now I have this piece of equipment. Like we have got it for this original use case, but what else can I use it for?"

And the company that I was demoing for a few days ago, they're in that spot. They basically brought the drones in house and now they're like, "wow, like there's so many things we can use it for. We're going to grow our fleet significantly." They already have a fleet of 30, but that's going to be probably doubled.

So just to kind of walk through that a little bit, know, when drones first came out, was strictly a consumer thing as a toy, you know, for people to go have fun with. Then some people were like, "hey, like I could probably make a business out of this. I can take pictures of houses for real estate, whatever." Everyone started doing that. That was like, you know, there was no barrier to entry to someone going and buying a drone at Best Buy and taking pictures of houses.

So the service provider started moving into more exquisite types of services. you know, service for, to go do LiDAR maps or service to go do inspections for utilities. But then what happened is the utilities were like, "okay, yeah, you know, now we've seen the value. We can see like how this makes the inspection of our utilities way faster by like a factor of five. But we're still relying on this other entity. And sometimes they're late. Sometimes they don't deliver the data properly. Like, why don't we just bring this in-house? Let's just have our own drone program. We already have our own fleet of trucks with high-rise equipment. Let's do that with the drone."

So I think more and more what you'll see is enterprises just having their own drone fleet that they manage with their own operators and their own UAS manager teams. And just they're going to do it that way instead. And they're just going to find more use cases once they do that. You know, once the team is in there, it wants to do more. So they're, they're going to just keep using drones for more and more stuff. So I think that's probably one of the bigger ones.

Stephen McBride: What, yeah, fascinating. I never thought about that actually. You can imagine everyone's gonna have a chief drone officer. You would imagine. That's cool. What use cases are you most excited about? Because obviously everyone talks about the delivery, but listen, getting a hot burrito delivered by flying robot, cool. I love it as more than anyone, but what other use cases do you think are really gonna take off in the next three, four years?

Thayne Kollmorgen: I think utilities is going to continue to be really big. I mean, I don't know how many hundreds of thousands of miles of utility lines we have, but really just that whole industrial infrastructure use case where you're inspecting something, there's something big outside, whether it's a utility pole or a bridge or a refinery or something. It's some big structure, it's outside, it breaks down. And these things are... You have to crawl up there, you have to people with hard hats, have to have high-rise equipment.

So it's very difficult, it's very time consuming, and oftentimes it's not safe to have somebody all the way up there. So I think that inspection of large critical infrastructure, especially in the US, it's aging, a lot of it's pretty old. So it's a huge cost, but it's also super important because it's like this is the stuff that is the backbone of our civilization. We need the power lines to work, we need all these energy. pieces of infrastructure to work.

So I'm very excited about that one. That's really the one that we're attacking first. But I think that one's just going to grow and grow because the value is just so clear. You have a safer operation. It often takes, you know, anywhere from 10 to five times less time. critical infrastructure will be very big and continue to grow.

Stephen McBride: How do you think about, you mentioned Dedrone earlier and I believe they're kind of like drones for public safety. Do you think after, you know, obviously Trump assassination attempt, Charlie Kirk assassination, multiple things have happened. Do you think, I mean, it seems crazy that in five years, every stadium, every concert, every political rally, every public gathering over some size will have a, it seems like it's gonna have drones as, as you know, watchmen essentially.

Thayne Kollmorgen: Yeah, I think that's 100 % true. It's just so easy to go... I mean, you have to be a little bit sophisticated, but it's not that hard to just go make a drone frame. You can make it out of pretty much anything, especially if it's just going to be one of these one-way attack-type drones. It's pretty easy. That's more difficult if you're in a battlefield, because now you have jamming, and so you actually have to get the radio piece right. In a battlefield it's all about like "how can we produce these for as much of these as possible for cheap and make sure that it actually gets to the target?"

But if you're in like the homeland and there's not like massive radar jamming and all this you know GPS jamming and all that happening, anyone can kind of go make stuff and just get on target pretty quickly. So I think yeah I think that's exactly where it's going to go. I would if you could get stock into like a anti-drone company I think well, because I think they're just going to put them up everywhere because it's just going to have to happen. It'll be too much of a danger not to happen.

Stephen McBride: How do you think drones will change the average person's life over the next five years? How will they see them in their everyday life?

Thayne Kollmorgen: I think in terms of people actually seeing it, because the infrastructure stuff is all in the background. You're probably not going to see a lot of that because a lot of times those things are in remote areas. I think the one where people will actually see it is going to be more in the public safety space.

Drone as First Responder is a really big use case. We're not really planning on that. But there's a few, there's several, there's probably like four horsemen there that are going to beat the crap out of each other trying to win that market, but they're all going for it. And so that's going to be very real.

You know, like when you see a 911 call, you're going to see a drone respond to it more and more. So think that's going to be one where people really notice, "Hey, there's drones responding to my car crash. I crashed the car. All of sudden the drone's going to come here and like evaluate it."

The other one I think is delivery. That will be the other one where people like actually see it often because they're going to roll that out and it's going to make such a big difference for the last-mile delivery of small things rather than like coming on a truck,

you're just going to get it on a drone. So those probably be the two where people actually see a lot of what's going on.

Our stuff's really going to be more in the background. You won't really won't really notice it.

Stephen McBride: Where are we with swarm technology, autonomous technology today on drones? Is it, are we still in the first inning? Does it even work? Cause it's kind of like, that's the one that maybe frightens some people, but also excites others. So where is the technology today?

Thayne Kollmorgen: You know, it's where I see it the most is in these drone shows. And, you know, they've gotten pretty good. Like they're some of those shows are quite exquisite, especially in China. You know, I think a little bit of...it's kind of like, "hey, yeah, we have drone. Look at our drone show." But also like, "we have a thousand drones swarming together. Like, don't mess with us, because that could be a military weapon as well."

But I think it's definitely early, but it's well on its way. There have obviously been a couple of high-profile accidents with drone swarms where they've come down and hit people and that's obviously not good. But I think like anything, people focus much more on when something went wrong than like the hundred other times that it's gone right. So I think it's coming along.

And then the other use case where I've seen swarms be used quite successfully is with the crop spraying. So they have these, I'm sure you've seen them. These, they're much bigger. They have a tank, they'll spray pesticides or whatever. And they'll use several of them because the swath width is not huge on, on a sprayer. You know, if you're on a ground sprayer in agriculture, you're talking about like, you know, 40-foot booms on either side, the swath is massive.

And so if you want to get something close to that, or even like a crop-dusting air aircraft, you need to use multiple. So I've seen people use multiple and they'll just kind of all go out in a line, spray, move over, all go on a line. So I could see that be used more and more as well, at least on the commercial side of things.

Stephen McBride: Are there any recent stories that kind of made you stand up and take notice? One I saw was the Colombian Black Hawk was downed by a drone. You can say a really positive one on the commercial side. I love the spraying one. I also saw one about, you know, they're tagging whales now in the ocean, but then maybe on the military side as well.

Thayne Kollmorgen: Yeah, I think, I mean, there's a little bit of recency bias here with my demo, but I was demoing for a large theme park. And that was really cool. Sorry with this chicken in the background. I don't know if you can hear it.

Stephen McBride: I love it, the Hawaiian roosters.

Thayne Kollmorgen: Yeah, he's croaking off. But yeah, I would say like that was just very impressive. Having been in drone operations for a while, I mean, I thought my operation was complicated when I was doing it in agriculture, because we were doing these very, very big surveys of these large fields.

This use case in the theme park was just crazy because they have, you would not believe what it takes to keep the wheels on the track for a theme park. There's so much infrastructure. There's a whole operation that takes place every evening to make sure that the rides are working tomorrow. And they have it all worked out. If this ride's like not working, you know, we're losing this amount of money.

So anyway, it was, I just found it extremely impressive what they were able to do. It's a fantastic use case. Cause it's like, they went from an inspection of this ride taking like five hours to 15 minutes with the drone. So I thought I found it very compelling cause the use case was just like clear as day. And then the, the operation was just amazing.

Just watching these guys at night to go up these huge structures and fly in probably one of the most like RF-rich environments. I mean, it's just like, you got people's phones, you got like rides putting off RF, they have all these RF ID tags. And so yeah, it was, was extremely impressive what they were able to do and just the amount of value that they produced for the theme park by doing it. I found that to be very, very compelling.

Stephen McBride: So five hours to 15 minutes, that's an absolutely incredible use case. Just say a little bit more about what you're working on, what specific segment of the market you're going after, where are you in the development of the company?

Thayne Kollmorgen: Yeah, sure. So we, if people know DJI, we're making something that will be very similar to DJI M350 or now they have the M400. So it's going to be in the medium-small UAS category. We are targeting inspection first. So that will be, we're making the payload, making the drone, the payload, the controller and the battery.

The payload will be oriented for inspection. So what you need there is a zoom lens, a wide lens. We're going to actually have a floodlight on it as well. And then you need a laser rangefinder to kind of tell your distance.

So that's what we're starting off with first, and then from there we'll add on more payloads. There's a bunch of payloads that people need. So we'll have a mapping

payload. We'll have one that has thermal. We'll have a gimbaled LIDAR. We'll have a spotlight. There's our product roadmap. There's still like ton of very interesting things that we'll build off of that drone. And then we'll move on to smaller and larger models as well.

And in terms of where we're at, we have a flying prototype of the drone. We have our controller, just ordered the PCBs for the controller. We have... Our software stack is getting more mature. It supports kind of the first basic use cases that we want to address. And then our battery is also underway. It's not fully baked yet. But the whole system across all of those things I said is basically in the prototype phase.

And we just need to basically get it to a point where it's ready to be flown repeatedly over and over. It's not just like a prototype. So that's kind where we're at and what we're building. Our goal is basically, yeah, yeah, made in America. Yeah, that's right. But yeah, that's more or less what we're working on.

Stephen McBride: Awesome. Is there anything that we haven't talked about that you think is important for people to understand about the drone industry, where it is today, where it's going?

Thayne Kollmorgen: I think we covered a lot of it. I guess the only thing I'll say is, you know, there's a lot of attention on the military side of things. And that's, that's for good reason. But I wouldn't underestimate the commercial market. There's already a very big commercial market. It's growing. People are figuring out more use cases every day for these things, just in a commercial setting. And I think they're with DJI going away, you're just talking about the tool that everybody that 90% of people love is about to just get clipped.

So you have this like, I think the commercial markets very exciting because you have basically a huge, a great demand picture, and then also like a supply chain crunch. And so I think you're just setting up for like, a bunch of alpha there. So that'd be the only thing is just don't forget about commercial. Commercial is very important. And those guys are going to be very much hurting if, if, when, when and if DJI goes away, they're going to be stuck. we got to kind of.

Stephen McBride: And just for anyone who doesn't know, where are we? Is DJI getting completely banned in America? Is it getting completely banned for everything? Only certain use cases. What is it? What's going on there?

Thayne Kollmorgen: Yeah, so it's obviously banned federally. So none of the federal entities can use it. 10 states have now banned it for public entities. So it's mostly affected public entities, but it does affect groups that work with public entities. So there's a lot of, you know, just businesses, they're not part of the government, but they do work

on behalf of the government, or they do work for people who have stuff on government land, and they can't use DJI in those cases.

And so, you know, I went back and looked at the Huawei ban and some of the other bans, and usually it's like about a three- to four-year process. People start talking about it. It sort of has to work its way through. And then eventually, yes, the ban shows up and happens. So I believe we're in year three of this saga. the clock is about to strike midnight. And a lot of people are seeing the writing on the wall. So a lot of people that maybe...

Strictly speaking, they don't have to use a non-DJI aircraft right now. They can see where it's going. So they're in the process of refueling currently. So it's coming down the pipe. I believe DJI is also set to be reviewed here shortly by the FCC. That one might be the nail in the coffin, but it's basically around the corner. I think pretty much everyone knows it.

Some people are reacting differently. Some people are still in denial land like, "no, it's not going to happen. We're still going to use our DJI. We love this product. We don't want to like... be done with it." Other people are like, "okay, yeah, see where this is going. We need to figure out how we get out of this quickly because we rely on these things now. It's part of our operation. We have to have it. So what are we going to use if they're gone?"

Stephen McBride: Fascinating, fascinating. Maybe Thayne, what we could do to finish is play a game of overrated, underrated. I'll give, say a dozen drone related technologies or use cases and you can say overrated, underrated or properly rated. Sound good?

Thayne Kollmorgen: Perfect.

Stephen McBride: All right, we'll start with the civilian stuff. Drones as first responders.

Thayne Kollmorgen: I would say slightly overrated but about approaching where it should be.

Stephen McBride: Drones for public safety.

Thayne Kollmorgen: I'd say it's appropriate.

Stephen McBride: Drone delivery, civilian drone delivery.

Thayne Kollmorgen: About appropriate.

Stephen McBride: Inspecting critical infrastructure.

Thayne Kollmorgen: Underrated.

Stephen McBride: Okay, maybe some military ones now unless I forgot something on the commercial side, I'm sure of it. AI swarms. Drone swarms

Thayne Kollmorgen: I would say about appropriately rated.

Stephen McBride: Kamikaze drones.

Thayne Kollmorgen: Maybe a slightly verging on overrated.

Stephen McBride: Tethered drones, that's been one of the weird things to come out of Ukraine.

Thayne Kollmorgen: That one I think is underrated, especially as it relates to commercial use cases.

Stephen McBride: Interesting. Say more for a minute maybe.

Thayne Kollmorgen: Well, there's, you know, obviously there's the fiber optic stuff, but there's a ton of use cases where, in the civilian world, where you just want a drone sitting there for some reason.

One of the most underrated ones is probably lights. So there's all these light towers, right? That you'll have, you'll put up a light tower for like construction. So you can see in the...what you're doing in the dark or whatever. But like, you could put a light on a drone, and that makes now your light can be way bigger because you can put it higher. It's easier to move it around and collapse faster.

And obviously like the construction use cases, one that comes to mind there, but there's public safety use cases. If there's a car wreck at night, you need to light up the area. So I wouldn't be surprised if you get to a point where DOTs, you know, they have those DOT trucks that respond to various incidents on the road. I wouldn't be surprised if at some point you just have a little drone pod that sits in the back of that thing.

The guy's going to drive to wherever he needs to go. He's going to press a button in the cab of his truck and a light's going to pop out of that from the drone. So that's one, but yeah, the whole tether thing, there's a bunch of, once you look into it, there's just like all these different things that you can start doing when you get creative about a particular feature. So I think that one's underrated.

Stephen McBride: Fascinating. Maritime drones.

Thayne Kollmorgen: Probably underrated.

Stephen McBride: GPS denied navigation or electronic warfare.

Thayne Kollmorgen: At this point, I think overrated. People know there's a lot of people working on it.

Stephen McBride: Mmm. Alright, I'm gonna do a trio of anti-drone stuff. So first, microwave weapons.

Thayne Kollmorgen: I would say probably about appropriate.

Stephen McBride: Anti-drone lasers.

Thayne Kollmorgen: I would say a little underrated, I haven't heard a ton about that.

Stephen McBride: Anti-drone turrets.

Thayne Kollmorgen: Overrated. Definitely overrated.

Stephen McBride: Okay, last two, Israel's Iron Dome.

Thayne Kollmorgen: Ooh, Israel's Iron Dome. I'd say probably...

Stephen McBride: Maybe specifically the drone aspect.

Thayne Kollmorgen: Yeah, I would say. I'd say borderline overrated. Well, if you were talking about drones, then it's probably not appropriate. There's some other weaknesses in Iron Dome, but those are less drone-related.

Stephen McBride: Last one, fixed-wing drones.

Thayne Kollmorgen: I would say slightly overrated.

Stephen McBride: Very, very interesting. Well, Thayne, thank you so much for your time. Where can people find out more about you, what your company's working on? Keep up to date with all that's going on.

Thayne Kollmorgen: Yeah, I mean, you can I'm on Twitter. I think it's like [t kollmorgen](#). I don't post there a ton. But when we start having more to show definitely be posting

there. Thoron.us is our website. It's a little bit of a placeholder right now. But that will also get more mature.

Stephen McBride: Just how do you spell that for people who might need to know?

Thayne Kollmorgen: t's T-H-O-R-O-N.

Stephen McBride: Awesome.

Thayne Kollmorgen: So yeah, those will probably be the two best places. We're pretty dormant at the moment, but that'll pick up here in a little bit once we have more cool stuff to show.

Stephen McBride: Stealth is the most exciting place to be, right?

Thayne Kollmorgen: Yeah, we're just kind of flying under the radar for now, but yeah, we'll have a lot more to show here, hopefully in the next couple of months.

Stephen McBride: Well thank you so much for time, enjoy Hawaii and we'll catch up soon.

Thayne Kollmorgen: Yeah, for sure. Thanks. Great talking with you.