AJ Piplica on Acquisition Talk

[00:00:00] **Eric Lofgren:** Welcome to acquisition. Talk a podcast on the management technology and the political economy of weapons systems acquisition. I'm your host, Eric Lofgren You can find this podcast and more information, including links, commentary, and articles on acquisition. talk.com. Thanks for listening. .

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[00:00:19] **Eric Lofgren:** pleased to be joined by AJ Piplica founder and CEO of Hermeus, a company that is developing a Mach five aircraft named the quarter horse, and is just partnered with the us air force. AJ, thanks for joining me on acquisition talk.

[00:00:32] **AJ Piplica:** First off, thanks so much for having me on the pod. It's a funny experience.

[00:00:35] I'll tell you a little anecdote. I was uh, in a meeting at the Pentagon with a three-star and I said something around acquisition and he was like, oh, did you study acquisitions? I was like, no, but I did listen to acquisition talk last night. It's funny

[00:00:46] **Eric Lofgren:** experience making you a little bit smarter every day,

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[00:00:48] **AJ Piplica:** little bit.

[00:00:49] But yeah, so a little bit about about the company. Founded Hermeus back in 2018 with three other co-founders the four of us all came from the commercial space world space X blue origin. We were together at a small company called generation orbit for about three years. We learn a lot about how to develop complex systems and in today's world.

[00:01:07] And through that experience it was obviously working. I've shot vehicles. And uh, kind of saw that the technology to build a Mach five reusable aircraft was mature enough today, at least at the component level to start trying the other, there really aren't any kind of science miracles that need to happen.

[00:01:24] It's really focused on the engineering of how you get everything to work together at the system level efficiently enough to actually go fly a mission, up to Mach five and back. It's pretty clear to us. The technology is there to do it. But it required a different approach than had traditionally been taken and hypersonics world or, and also aircraft development in general.

[00:01:42] And that's really, I think, where the commercial space or new space upbringing that we all had really came into play. The kind of core pillars that we've established at the company that then come from that world, or number one, vertical integration that's even more important in these types of aircraft than it is things that fly slow.

[00:01:58] The faster you fly, the more coupled all the components are, the harder it is to draw a line between where the engine stops and then the aircraft begins. So that really has to filter out into the entire organization. Now number two is being really hardware focused. We live in a world of digital engineering to for for many folks and think is incredibly important that we always stay grounded in the hardware, because that's really where the rubber meets the road.

[00:02:22] And finally getting integrated hardware and software systems as quickly as possible, and then iterating I think we've in some cases lost that willingness to, to build hardware and break it and then iterate on that relatively quickly. And I think that's been a really strong underpinning of the commercial space world that we're bringing to the hypersonics world and the commercial aviation worlds here in the future.

[00:02:41] Yeah the big picture long-term vision that we started the company to go after is accelerating the global human transportation network by building Mach five passenger aircraft. It's not an easy mountain. We've picked the climb here, but when we looked at. Of course the technology the national security applications of the technology, and then the kind of private funding environment that we're in today.

[00:02:59] It was pretty clear to us that we're in this like perfect storm of timing to actually make something like this, a reality today where, five years ago, this wasn't the case. Hypersonics was not the priority that it is today. I think you've seen on the private side, a number of, big exits where folks have been validated and their investments in aerospace companies, which hasn't been, hadn't been the case before that.

[00:03:22] So that's, really pushing folks to find the next small satellite market or, small small launch market, given that those two are relatively saturated at this point. And, the hunch that we had was, Hey, this could be this high speed aircraft thing could be it.

[00:03:34] I think we saw we'd see. What other companies have been able to do Ariane at the time and boom and others, any other large chunks of private capital. And, we thought they were not necessarily going about it the right way. Because at the end of the day to get to a passenger aircraft, you're going to need billions and billions of dollars.

[00:03:48] So how do you finance that's frankly, a harder challenge than the technology itself and for us, it was always, you had to solve problems for customers along the way. I'll harken back to space X plenty. I'm sure over the course of our discussion, but they, didn't set out to make humanity.

[00:04:03] Multi-planetary a multi-planetary species expect to do that without bringing in some pretty significant revenue along the way. That's how we've set ourselves up from the very beginning to go achieve this goal.

[00:04:12] **Eric Lofgren:** there's a number of interesting things you pointed on there first is the development process, and we'll definitely circle back to that.

[00:04:18] And then also the financing and you got some financing from the government, which was a big story for the air force as well, and their ability to do that. So we're going to circle back there, but first I want to dive just a little bit deeper into the quarter horse itself.

[00:04:31] First, can you just talk about, what is the engine what's new about it? And how are you going to? Sure. So

[00:04:36] **AJ Piplica:** quarter-horse in and of itself is really a vehicle is designed to do two things to touch Mach five and to be reusable.

[00:04:41] There are all these challenges to building a hypersonic passenger aircraft. We'd be a naive to go try and bite them all off at once. So step one for us is build an engine that can operate from not moving on the ground to Mach five at 90 to 100,000 feet and demonstrate that in flight. So that's really what is driven, what quarter horse is.

[00:04:58] The engine is, what's called the turbine based combined cycle engine. It's actually a combination of two different types of engines. So you have a traditional gas turbine engine. Which is very similar to what on today's aircraft. Just straight turbojet on quarter horse.

[00:05:10] And we use that for all of our flights up to about or by itself all of our flight up to about a Mach one and a half block to that's kinda what that engine the J 85 was designed to do powers the F-5 E/F supersonic fighters. , and then the other piece of the engine is a Ram jet.

[00:05:27] No moving parts uses the compression of air that happens over a shockwave to compress the air, burn it, and then exhausted out of nozzle. So it's a fairly simple device in and of itself. But unfortunately can't operate until you're going super Sonic speeds. So the turbo jets there to get us up there we start the Ram jet up in the kind of Mach three range.

[00:05:45] And then once it started, we accelerate up the rest of the way. So there's this gap between about Mach two and Mach three, where Ram jets don't really work well enough because there's not enough compression and turbo jets don't work well enough because you can't burn them hot enough with the turbine downstream of the combustor.

[00:06:01] So that's the questions like how do you bridge this valley of death, if you will, in the propulsion world, . To actually get the sensor to work and the way we've come up with doing that is putting a pre cooler in front of the gas turbine engines. Essentially, yeah. Air at Mach three ear coming into the engine is around 800 degrees Fahrenheit and the pre cooler cools down the air so that by the time the air gets to the compressor face and the gas turbine it's down to about 125 degrees.

[00:06:28] So the cools down, 675 degrees in about a 10th of a second. So it's not a very efficient system. important that we accelerate through that regime relatively quickly and then transition to the ram jet, which is much more efficient and keep climbing from there. We've designed the architecture around existing gas turbine engines, and that's like a real key, designed feature, not just from a technical standpoint, but from a kind of holistic business standpoint as well.

[00:06:51] One of the first questions you'll get from an airline, you try to sell an aircraft like this is okay, what's your power plant. And to develop a clean sheet gas turbine engine, that's does exactly what we want it to do. Would probably be a decade and a couple of billion dollars.

[00:07:03] And that's a pretty tall order for most folks. Unfortunately we don't have a billionaire founder to bankroll us, so we have to do it the hard way. So basically what we've done is we've designed the entire engine architecture around the assumption of the gas turbine that's going in there as an off the shelf engine.

[00:07:16] So for quarter horse reason, the JD five which is a tried and true engine has been around for, I don't know, maybe 50 years at this point. We've designed a bypass system for it so that when we get to Mach three, all the air goes around the gas turbine and then straight into the Ram jet in the back and then out the nozzle.

[00:07:32] Similar to the way that the J 58 did it on the Sr 71. But fully bypassing the gas turbine. There's some doors in the front of the doors in the back close up when you're above Mach three, all the air goes around and it acts so the whole Internet's like a pure Ram jet. There's a lot to unpack there.

[00:07:48] We've already built and tested a sub-scale version of this architecture, where we've proven out a couple of elements of it, not everything yet. But we've proven out the pre cooler. So we've shown in a wind tunnel that we can run a gas turbine engine that was only designed to fly to Mach 0.8 at 26,000 feet.

[00:08:04] We flew it in a ground test facility up to the equivalent of about 60,000 feet at Mach 3.2. So like faster than the Sr 71 for an engine that came from, tiny little turbo jet from the Czech Republic. And also proved out that the Ram jet port. Could operate down low enough.

[00:08:20] So there's some overlap between the two modes of flu that are tested that from about Mach 2.7 up to mach four. So got enough data to be confident that the architecture works the way that we expect it to. And now we're in the process of building that first full-scale engine for quarter horse getting on the test, stand here in the next month or two and then demonstrating the real hard part about that, which is the transition from turbojet to ramjet and back.

[00:08:41] So that's still coming in the future. And then of course flying it, this type of engine has never flown before there've been other ground development programs. DARPA's program is a pretty good analog larger scale but similar type of configuration. So there's there's gonna be a lot of firsts in this program.

[00:08:55] But yeah, mostly focused on all the engine.

[00:08:57] **Eric Lofgren:** you mentioned eventually you want to get to Mach five and 90,000 to a hundred thousand feet. Where are you thinking theoretically, the range is to fall here,

[00:09:06] **AJ Piplica:** Like the range for the aircraft. Yeah. Oh so for quarter horse, it'll fly a couple hundred nautical miles.

[00:09:11] The range of the eventual transport aircraft will be around 4,000 nautical miles, so long enough to cross the Atlantic ocean without stopping and stop across the Pacific. Okay, great.

[00:09:21] **Eric Lofgren:** And how about the aerodynamics? There's been a lot of talk about, trying to calculate exactly how. Fluid dynamics is going to work, those types of speeds and temperatures, what are you guys doing there?

[00:09:30] **AJ Piplica:** Yeah. W whatever we think it is, it'll be wrong. pretty straightforward kind of approach in terms of aerodynamics development for a vehicle like this lots of computational fluid dynamics and then definitely a good deal of wind tunnel testing, both for the vehicle side.

[00:09:43] To understand kind of the forces and moments that the vehicle would experience what it's flying how it will be controlled but also separately for the inlets for the engine. So it's, like I said before, it's hard to draw a line between where the engine stops in the aircraft begins.

[00:09:56] The inlet is probably the most ambiguous part of the whole thing, because, it's provides the primary compression for the engine when you're flying really fast and about 80% of the thrust up above Mach three. So it's super important from a propulsion perspective, but you're also generating a good deal of lift from it out front.

[00:10:11] Yeah, super important components. It's got its own wind tunnel test campaign so that we understand both the kind of aerodynamic performance elements of it, as well as the propulsion performance elements of it. The air dynamic challenges for a vehicle like this are pretty significant.

[00:10:24] The biggest one is you have to be super low drag. You need to balance being able to get off the runway with being, which requires, as much lift as you can give it getting through the the sound barrier breaking sound barrier, mark one, which requires smallest amount of, cross-sectional area and drag that you can give it.

[00:10:39] And then a couple of other pinch points where the kind of, the net thrust that you're generating. So the difference between the thrust, the engine is generating the drag of the vehicle has, are very small, 10% of the thrust is actually net thrust is being driven to acceleration.

[00:10:53] Those pinch points are really the critical ones where you really have to bite on the uncertainties as much as possible on the ground. But, at the end of the day there's still going to be significant uncertainty. That the only way you're going to buy it down is by going and flying.

[00:11:05] There's plenty of phenomena that can happen in small portions of the vehicle that can have very large either aerodynamic performance or control or pulse and

performance implications boundary layer, transition, and how shockwaves interact with pantry layers can be really significant even though they're tiny little things.

[00:11:21] This is one of the hardest things. Designing vehicles for hypersonic regimes is that we really don't have a lot of data to anchor the models that we have. So we're not shooting in the dark. We know what we're doing from a kind of first principles physics standpoint, but the uncertainty bounds on all the analysis and the ground testing that we're doing are still pretty big.

[00:11:39] I think we've flown maybe like 15 minutes above Mach five with an air breathing aircraft and like the history of the United States. So there's a lot to be learned from operating these regimes that's gonna drive future iterations of so vehicles like this.

[00:11:52] **Eric Lofgren:** You're not going to have to have the problem or do you face the problem? Like it doesn't the the Concord didn't have an articulated nose. It seemed like overly complex. I said to see

[00:12:00] **AJ Piplica:** literally that's why I'm so yeah, this a quarter horse won't have a person on board.

[00:12:05] So it'll have a combination of different systems that allow it to operate the way it needs to GPS internal throw measurement units. For neural navigation there'll be cameras altimeters, all sorts of different sensors that give it the situational awareness that it needs to operate, but it'll fly pretty similarly to a rocket.

[00:12:24] It's not going to be a like strongly autonomous vehicle. It's going to be making a bunch of decisions the way a pilot would. It's going to be a fairly kind of simple rudimentary instead of autonomy where it's, following a trajectory with way points and and so forth. But yeah. These vehicles are Laden with all sorts of different trade-offs where the right answer. Isn't blatantly obvious and it, can very often come down to engineering judgment and going and figuring it out. Cause yeah, engineers can debate all day as to when a boundary layer is going to transition and you don't know that you go

[00:12:54] **Eric Lofgren:** fly well that's I think that has huge implications just for the acquisition process.

[00:12:58] Being able to let them. Figure it out. And we'll definitely talk about that, but I want to hit you with a couple of Peter teal questions here for now. What's an important truth that very few people

[00:13:07] **AJ Piplica:** agree with you. Yeah. Two part answer to this one number one, that you can build a Mach five aircraft with today's technology.

[00:13:12] So maybe that's obvious, but number two is that you can do it without a billionaire founder. And that's, I think the real key to what we're pushing for here. The amount of capital that is necessary for these types of projects is obviously huge, but being able to do it solving problems for your customers along the way at each stage is how.

[00:13:28] You bridged that valley. So yeah that's the other piece.

[00:13:31] **Eric Lofgren:** Yeah. We love the lean methodology approach here. I think that's going to make a lot of sense and we're going to talk about the financing piece as well. Here's another Peter teal question. They promised us flying cars and all we got was 140 characters.

[00:13:44] So has technology progress actually slowed down since the 1970s, particularly in hardware? Yeah,

[00:13:49] **AJ Piplica:** so I, I think there areas where we're definitely has certainly in areas where the vast majority of work over the past couple of decades has resided within the realm of governments. Broadly, and I'd say let's maybe leave the last decade out of fixing things.

[00:14:04] It actually starting to change quite a bit. Space, Microelectronics, hypersonics. These are areas that have for a large part, been part of the realm of governments for quite some time. And now, and nuclear is probably another one. I think over the past 20 years, you've seen a really strong transition to, just look at the R and D spending that's happening privately versus in the government, in some of these areas.

[00:14:27] And it's pretty impressive. Not only that forget the amount of dollars going in. Look at the capabilities coming out. The only company to be able to land a orbital class rocket booster is private, is developed privately not. Yeah, the government didn't have a very important role in that process.

[00:14:43] And I'm sure we'll touch on that a bit later, but yeah, I think the ability of private companies to drive innovation and technology development in dual use technology areas has been key to hopefully taking that question and then turning it around over the next next couple of decades.

[00:14:59] **Eric Lofgren:** .

[00:14:59] Do you think just like the software mentality, like that was like the free and open space that hadn't been regulated and people were innovating there and now it's it seems like, especially with the new space, bringing that kind of culture into new space and now it's like almost.

[00:15:11] Spreading it out everywhere. Do you see like that, it's what's going to bring us out like the actual application of software, but then also the processes that go along with in terms of iterate.

[00:15:20] **AJ Piplica:** Yeah, absolutely. I think that's huge. You look at how you take risk, which is, how things happen quickly is you have to be willing to take risks.

[00:15:27] And the only way you can take risk in hardware is if you have a lot of hardware to be able to risk, and you can do it in a manner that's not taking risks with human lives. Like when you're building something in the real world, you don't get the press compile that much. So when you do, you have to make it count.

[00:15:41] But really the more chances you give yourself to do that, the more effective, the end product's going to be. And I think that's really where things have started to change. If

you look at every flight that, and I'm going to use basics too much in the course of this interview, but every time they flew a vehicle for a customer that was leveraged as an R and D flight test opportunity.

[00:16:02] And I don't think they necessarily get enough credit for this, but every mission, they, every commercial mission, they flew with falcon nine. Every NASA mission they flew with Falcon nine was an opportunity for them to attempt recovery. And they failed a lot and the blooper reel is one of the, my favorite videos on the internet.

[00:16:20] But through that, they figured out all things that you had to do to get it to work. And then. Yeah. From a flight test quote-unquote standpoint, that's spending a dime of their own money because they're leveraging opportunities that are already there. So yeah, I think being very creative about how you go get the data and do the iteration that you need.

[00:16:38] Because most customers who are buying launched services, they don't want the rocket to change. But if you look at the first like eight 20 Falcon nines, like any of them, but the same. So the ability to change, but still provide a reliable software solution or service or products to your customers is huge.

[00:16:57] Because if the way you've ingrained reliability into what you're doing is by saying, okay, we did this, it worked, it's never going to change. Then you're going to have a very hard time improving on that in the future. But if you've set up your processes to accept that the only constant.

[00:17:10] Life is change. Then you're gonna be much better off to take everything that you learned and actually integrate it and improve, the current product or feature products much faster than would otherwise be possible. I think that's where that kind of software mentality comes into

[00:17:23] **Eric Lofgren:** hardware.

[00:17:23] Yeah. Only a constant life is a change. I love that. When I think of just like regular defense programs, like major programs, right? If you look at the F 35, for example, people will actually be like, oh man, like every lot had a different specification. And they were like changing along the way.

[00:17:39] And the real problem was they didn't just lock down the design, back in 2007 or when they were going through milestone C X, actually, they didn't go through my, the for a lot later. you know, Like that whole idea that oh, now we have all these different logistics tails and all these, things that are going on at the same time.

[00:17:52] That's a problem as opposed well, you should have anticipated that and built your processes like around that to accept it and then actually be able to accelerate. So I kind of want to talk about. Some of the things that you're doing in your development process and you named them upfront and then how it differs from what we traditionally think of that the defense primes really go at it.

[00:18:11] And of course the defense primes go at it in a certain way because the government processes, force them or incentivize them in many ways to be like that. But, we were talking about space X and Elon Musk of course, famously vertically integrated what he was doing over at space X. And you said the same thing. Now, of course, you're getting a very proven turbine engine, to base that around. But you were saying it's hard to determine where the engine stops and the aircraft starts. So where does that make buy decision? And then. Y vertically integrated because again, a lot of the defense primes, like 70% is actually just subcontract, sometimes subtract subcontract it to themselves, at a different business unit, but they're like prime integrators systems, engineering, program manager types. And assemblers, of course they want to keep this assembly, but uh, can you talk a little bit about that vertical integration make, buy decision and where that kind of falls,

[00:18:58] **AJ Piplica:** there's a number of different elements to, to unpack there.

[00:19:00] I'll try to hit a couple of them. Number one, just right off the bat on make, by the kind of the way that we think about that is if something exists on the shelf that will work for, the application that we have let's buy it. There's no need to reinvent the wheel, but if something needs to be designed from scratch or something needs to be modified to meet our requirements, that stuff has to happen in house.

[00:19:19] And the real reason for that is not cost, but schedule. Being able to have as much control over your schedule as possible and really holds your destiny in your own hands. Is it more important than near the amount of CapEx that has to go into to building that up in the first place. Because time is money.

[00:19:39] It's a, it's an old adage for sure, but it's absolutely true. If it takes you an extra three months to do something, your whole company's burn rate is accumulating that, that time, if you're on the critical path. Having more control over your schedule is a huge reason for vertical integration.

[00:19:51] We've seen the supply chain issues happening right now. We feel them whether it's from electronics standpoint or fabrication capacity, there was a time over the past couple of months where , we had exceeded the amount of additive manufacturing capacity that we could get ahold of which is crazy to think about.

[00:20:07] And the lead times that we're seeing where, a couple of years ago, you might be able to get an additively manufactured part. And in two weeks, it's now, eight to 10, if you're paying an extra day fee. So, Yeah, time is the real key for vertical integration. But a couple of other things that come along with that, and it touches on one of the elements that you brought up, which is, systems engineering. Understanding how your system works from the bottom of every subsystem, all the way up to the top is incredibly important.

[00:20:32] And not just at the top level, program management of a pro of a program or even at the corporate level. But all the way down to the people, turning the bolts and so forth and turning the wrenches because like in order to make good decisions, you have to have sufficient context to do that.

[00:20:48] And these vehicles are so tightly coupled in, in their design and how they work. And they're obviously very multidisciplinary. You can make a small change in, an engine component that you think is improving that components efficiency. Whereas at the system level, it's actually a net negative.

[00:21:04] This happens all the time. So like you need the tools to be able to understand how design changes affect, system level parameters, whether it's performance or cost or schedule, whatever. But you need to give that decision authority down. Yeah. Lowest level possible. And the only way that you could do that is within a vertically integrated organization.

[00:21:22] It keeps people's kind of incentive structures, aligned. Anytime you add a layer in a supply chain not only is that, a layer profit that has to get generated it's also now having to kind of align motivations and incentives. If you're working with a supplier that you're when you 1% of their business, you're probably not going to be a priority for them.

[00:21:41] Now, if you're 50, 60, 70, something like that. Sure. But that's not going to be the case. So that's another way that we look at are there places where. Something's very critical for us, but not very critical for a supplier. That's like a kind of red flag for for our risk down the road.

[00:21:55] So those are things that will, that we'll bring in house as well. It's not something you can do overnight. The cap ex to become a perfectly vertically integrated company. You'd never get off the ground if you did it right off the bat. You have to transition over time to bring more and more in house as it makes sense.

[00:22:08] And as the company grows, the amount of capital that's flowing in and out of the company grows you can afford to bring more things in house and have that schedule control, but the trick is of course making it to that point.

[00:22:19] **Eric Lofgren:** . As you were talking there, it reminded me a little bit of a Frederick Brooks, but then also modern software programming.

[00:22:25] So Frederick Brooks was. All of the pieces, it's not like interchangeable parts going down to the assembly line. Everybody has to be on the same page and that coordination, follows more of a Metcalf's law or whatever, rather than, something like a linear progression, but then there's also the kind of stuff.

[00:22:40] Paradigm, which is let's bust up monoliths. And we're going to use these, interfaces standard interfaces so that each agile development team it's pretty much separable to a degree. But it seems like that only works when you have like high TRL or like high maturity components with which to build from that are commoditized.

[00:22:57] Is that kind of like how you see it is like we're in a frontier area. So we need to it's almost more of the Frederick Brooks model than like an Amazon AWS type model. Yeah.

[00:23:06] **AJ Piplica:** And I don't think we're quite there yet. Maybe down the road when we're on iteration three, four or five of these types of aircraft, right now we're on iteration zero.

[00:23:14] So we gotta figure out how to make the thing work and then optimize the process down the road. But one area where we do take, I think that type of approach is software and electronics. Those are. Yeah, you can't separate them from the way the rest of this works, there, there are things that doesn't necessarily scale from like a mass perspective as things get bigger.

[00:23:33] So designing your electronics and software, for modularity, cause you're like you're going to do a lot of the same processes in different parts of the vehicle the ground system and ensuring that everything had talked to everything else is usually important. You can do that right from the beginning.

[00:23:46] And that's like the bar for that is, is actually not that high. We can see the difficulty of that today. And in many of our military systems on an have 22, you can't talk to an F 35 without another aircraft in the air. Yeah. So it's super important to set that up for, the interfaces on the software and electronic side to be understood open. Yeah, that kinda sets you up for success down the road.

[00:24:06] Just not even externally, but internally.

[00:24:08] **Eric Lofgren:** So let's move right along here. You know, Most people will actually concede that software development requires iteration, of course. But then like in the DOD, it seems like a lot of people actually hesitate to say oh, I got a, billion dollar machine that people's lives are gonna depend on.

[00:24:23] So I got to go the traditional method. So what kind of like benefits do you expect out of iterating on hardware and how does that all work?

[00:24:31] **AJ Piplica:** Yeah, would you rather fly on version five of a new aircraft or version one? A, like we've been iterating on aircraft for a long time.

[00:24:39] Maybe it does. It doesn't necessarily look look like it has in software, but it's a key component. Like iteration is really where reliability comes from. reliability is a thing where you can do all of the system level modeling with failure rates and everything that you want upfront.

[00:24:56] What's really going to drive the last couple of nines that you need on reliability is flying, operating, finding the corner cases that you didn't think about, and then working them out of the system. And that is something that only comes from iteration. I think when you're interpolated, when you're working within part of a design space where there's a lot of data that exists.

[00:25:17] So take the T seven trainer, for example it's not really exceeding performance specifications beyond what other aircraft have done in any dimensions. It's not the fastest

aircraft ever. It's, it's not cannot fly the highest or something like that. So you're working within the bounds of what aircraft have been designed to do in the past.

[00:25:36] So that's. At least, from a DOD perspective that there's a lot of data out there. That's going to inform all of the models. And in simulations that you're gonna run around that aircraft that allow you to get really close. Like you understand how that system works very well or that type of system.

[00:25:50] You're making small tweaks into, in certain areas, but, at the end of the day, you're really interpreting inside that design space when you're building a hypersonic aircraft, when we've never operated an operational hyper, Sonic anything you're extrapolating, you're beyond the realm of available data.

[00:26:08] And that means there's a lot more uncertainty and the only way you can buy down that uncertainty is going and getting it. So that's where iteration is hugely important. Because we could. Try to design passenger aircraft, right off the bat. Given everything that, that we know today.

[00:26:23] But the scale of failure there is really big, like when you're spending a billion dollars to try once that's really difficult. Now you spent tens of millions to get to that first couple of tries. That's a different story. You're like the risk downside. There is so different, whereas the reward is on par.

[00:26:44] So if you can go buy down 80% of the risk at a couple of orders of magnitude, less cost and a decade faster even though you're not necessarily delivering that operational capability right off the bat at the end of the day you're probably going to get there. If you took a chunk of time and said, you do this without a prototype or with as much iteration as you want, but it's.

[00:27:05] Time is up. You're probably going to end up with a product. If you're going through the kind of iteration path that is higher performing lower cost, more operable then you know, one that has just been gone through the process once.

[00:27:18] **Eric Lofgren:** So are you guys prototyping these things with a digital thread

[00:27:22] **AJ Piplica:** Oh, we've been doing digital engineering and out in the engineering world forever. Siemens did a great job of branding it though. I will say. No. So like we have a number of integrated systems models that tie together all the analysis that's happening around a vehicle.

[00:27:37] So that we can understand, like I was kinda talking about before the implications of small design decisions in certain parts of the vehicle, to the overall system. Anytime we make a change in an engine component, then that kind of flows back through all the propulsion analysis, Aero analysis, mass properties calms everything back up to the system level where we've got our metrics for, Top speed, fuel burn, all those types of things that, to define what the vehicle can actually do.

[00:28:01] So in that sense, yes, we're absolutely doing that. The digital thread side which is related more to sorry, the digital twin side, which is like what's out in the world relative to what you're analyzing. That's usually important as well. For, we've never flown a reusable hypersonic aircraft before.

[00:28:15] Having understanding like what nominal looks like for a flight and comparing that to, what you did so that you have a good feeling for how airworthy the vehicle is for the next flight without having to do a complete tear down and inspection is hugely important.

[00:28:29] But I think digital engineering for hypersonic systems is incredibly difficult because of that lack of data to validate your models. So long as you've built up your systems and processes where. Your analysis tools are talking to each other. You're doing good.

[00:28:42] Multi-disciplinary integrated design and you're gathering data from the real world and anchoring all those models. Then yeah, you're going to be at a, in a good spot, but should we go digitally engineer, a production line for hypersonic aircraft today? Probably not, we should build a few first.

[00:28:57] And then maybe,

[00:28:58] **Eric Lofgren:** yeah, that was always my kind of, concern with the digital engineering. It was that it lent itself to higher like things that we've done before and were incrementally upgrading. But then the whole acquisition system is actually designed to do just that because you need the types of data and analysis to get a program, even approved and go get the money, go do it.

[00:29:15] And that only comes from incremental advances. And when we go to these, newer areas with high uncertainty, you might not have the information and you're stuck in like these small kind of S and T things forever. And it just kind of reminds me of, I guess the John Boyd's OODA loop, but also the destruction and creation.

[00:29:32] This is like the DOD in my mind is all about deduction. And there's not enough like empirical, interaction there. So it's interesting. What is that actual blend of, moving back and forth between these analyses and then these empirical evidences, but then not saying like I'm only gonna do

[00:29:48] **AJ Piplica:** Look back at the fifties and sixties, the golden age of aviation, we built a lot of aircraft. We crashed a lot of aircraft too, but we learned, and we iterated very quickly and we didn't have anywhere near the digital tools or competing power that we have today, as those modeling and SIM capabilities have become more and more ubiquitous, they're relatively easy to use.

[00:30:07] They're by comparison are relatively speaking, quite inexpensive. So it can be very tempting to rely on them very heavily to say Hey, we don't need to go to a winter when we've got know CFD. We don't need to test this thing. We've got FEA. But the real power, and I think this is what, one of the biggest lessons that we learned coming out of new space was it, you have to put those two together.

[00:30:27] You leveraged the modeling and same capabilities to get yourself in the ballpark. It's the 80% solution, but don't spend two years analyzing a problem that can be solved in two weeks by spending some money and testing. So it's really the, yeah. A mix between the two that's really necessary to move fast and be successful with that.

[00:30:45] **Eric Lofgren:** No, one other thing that kinda comes to mind I guess from your approach is that it's like an integrated approach, you know, like your founder, but it's kind of like kind of someone that's overseeing the whole thing. And one of the things that Bob McClain, who was a technical director, Trying to lakes and develop the Sidewinder.

[00:31:02] He was like, one of the problems is you can like start with this integrated problem statement. That's abstract. And then it goes to 50 offices and they each do their little piece of it. And then it comes back as an integrated problem again, from the guy on the line, who's supposed to make it work.

[00:31:16] And it's like this whole abstraction. It seems Like the department of defense needs a founder kind of methodology where it's like someone who's taking all of the different pieces and really integrating them. And then going out and doing it, it seems to be like the better

[00:31:28] **AJ Piplica:** method.

[00:31:28] Yeah, that's another piece of where vertical integration really comes in because you have control over a much broader spectrum within that design space then than you would if you're just a systems.

[00:31:39] **Eric Lofgren:** So I want to wrap up here on just can you talk about your engine test site that you guys put up?

[00:31:43] You said it, you did it in 33 days. So can you describe what that was? And. how that kind of rapid pushing to testing and iteration was that?

[00:31:52] **AJ Piplica:** Yeah. That was, it was an opportunity for us to really embody the culture that we're trying to build at Hermeus. So we took it the company's growing really quickly.

[00:32:00] We were, I think 13 people at the beginning of the year and we're, 35 now and we'll be around 50 by the end of the year. Getting people integrated into a culture that, that focuses on speed, decision-making accountability and teamwork. You can write all the words on the wall that you want, but really what you do is who you are to borrow a quote from Ben Horowitz.

[00:32:20] We really wanted to get people an opportunity to. Prove to themselves what they could do. It's amazing what people are capable of when you've removed the handcuffs that come from, in some cases, larger organizations, in some cases, bureaucracy, in some cases, just their own psyches.

[00:32:34] We we have a couple of different things that, that we push people to do. One is yeah, plenty of movie quotes here. So one is choose your own level of involvement. So flight

club it, there's no ceiling to what people can do at a company like ours, just given the rapid paces of growth.

[00:32:48] It really gives people the opportunity to make their own mark and grow along with the company. Number two is do less. So if you're never forgetting Sarah Marshall in the learning how to surf scene, you're doing too much do less. But yeah, I mean the requirements for things are often.

[00:33:04] Dumb like period requirements, or they're just never smart. So minimizing them as much as possible and getting to figure out like, what is the real thing that we need to do here. And focus like very squarely on that and then go do it. But the other bit is like preparation, there's a saying that luck is when preparation meets opportunity will speed is where preparation meets hard work and problem solving.

[00:33:27] So for us, the test facility we did this in a fairly nontraditional fashion. It's built out of shipping containers which is like a little bit of a homage to our heritage. We started our original test facility there and two shipping containers on a big grass field at the airport there.

[00:33:40] Now we have a building. But yeah, so prefab structures a lot can be done in parallel. We had a really tight loop with with the supplier that we were working with there. We're like integrating some of the tests facility infrastructure while they were still. The cabinets and the drywall and everything up at their shop.

[00:33:55] So it got everything lined up. Yeah. Started digging the hole and 33 days later we were running an engine. So yeah, it was really an opportunity for us to really embed the culture and show people what they're really capable of.

[00:34:06] **Eric Lofgren:** One thing that you were saying about, the opportunities that you're giving your people.

[00:34:10] I would, I was listening to Eric Berger. He had that great book on space X that came out and he was saying like, imagine if you're. Man or a woman that's coming into the industry young and in 2005 and you either get in on space X or you get in on they Orion spacecraft from NASA or one of their contractors.

[00:34:26] And then you just see like space X, they've gone through a hundred different, missions and they're doing all these new things. And they're repeating that with the star ship. And, then you look over at the other side, it's they flown one on crude mission and and that's been like 15 plus years.

[00:34:41] And so what does that mean to like people's ability to express , their creativity and their skill and, just like having that kind of work culture, sometimes I feel like too much of the government experiences on that that other side. And it's not the people.

[00:34:53] It's like the process that they're find themselves in. I want to talk a little bit. Yeah. So let's go back to the quarter horse Mach five aircraft on your website. It said it could add up to 4 trillion to global GDP. How'd you get there? Yes,

[00:35:06] **AJ Piplica:** that's focused on the transport aircraft.

[00:35:08] So let's say we are successful at building a Mach five transport aircraft, and that connects the world five times faster than ever before. We really wanted to understand what that meant. So we went back and pulled a bunch of literature from studies that had looked at accelerations and transportation networks and the implications that they had both from a social and an economic perspective.

[00:35:31] And there were a couple of things that we learned. So number one GDP and trade kind of trade works like gravity. the gravitational force is proportional to the product of the masses of two objects over the square of the distance between them.

[00:35:46] So trade works the same way where mass in this case is represented by take for two cities, the GDP of each city. And the distance in this case is an abstracted economic distance. So not just physical distance but the cost of traversing that distance, the time it takes convenience, those types of things.

[00:36:05] So that's a really good model for how effecting time affects trade. And then also in, in a couple of these other studies they were able to. Understand what the relationship between changes in trade and changes in GDP between the cities that are affected, where it's about one-to-one.

[00:36:20] So a 1% increase in trade as a 1% increase in GDP for the city. You play this all out with Mach five aircraft over the span of the entire world. So you're speeding up the global transportation network by five X. So you're cutting the distance effectively by, down to 20% of what it used to be.

[00:36:39] Now there's gonna be extra cost for that, because it's, you're going to burn more fuel just because of physics. It comes out to about 5% or so increase in trade on a global basis with yeah, speeding up the kind of major hubs to to five X, their current speeds.

[00:36:54] And yeah. Play that through the math comes into around a two and a half percent increase in global GDP. So if you look at global GDP growth out in the 2030s two and a half percent of that is around $4 trillion. So there's a lot that you can do with $4 trillion. I think there've been studies that say de-carbonizing aviation is, a $500 billion a year problem.

[00:37:16] So yeah, it's counterintuitive to think that like speeding up aviation could pay for decarbonizing it eight times over. So that's the scale of the problem that we're trying to solve here. And that's like the reason why we're doing this. This has a level of difficulty, arguably as hard as going to Mars.

[00:37:33] But we're not exactly a backup plan for humanity. We are unlocking a lot of the latent potential. In, the humanity has you look back at when Rome built out their roads networks. We switched from sail to steam power and Marine shipping. And when China built out their high-speed rail network in the 20th century, all of those were accompanied by like multiple single digit points in GDP growth in the affected regions.

[00:37:54] So being able to do that at a global scale has the capability to be really world changing for a lot of things. And we've all normalized to the speed at which the world moves. We had Concord, it was a blip technology arguably before its time. But yeah, we haven't changed the speed at which the world moves since the 1950, we haven't broken a speed record in almost 50 years, like an aircraft speed record in almost 50 years, which is like mind boggling.

[00:38:20] So yeah, there's a lot that humanity can do. We're held back on by the pace of which the world moves well,

[00:38:26] **Eric Lofgren:** is it the Sr 71 that still holds a speed record? Yeah. Yeah. That's not surprising, man, right? Yeah. Yeah, it's interesting, The Sr 71, they're contemplating having like whole fleets of like different types of those aircraft in the military inventory and the military just didn't bite.

[00:38:42] They're like stealth is justice. Good. So let's just go all in on stealth and then we forgot about hypersonics and there was all these reports we need to do hypersonic, wind tunnels in the nineties and air force. It's like, no, thanks. But, and now it's becoming a big deal.

[00:38:55] So maybe, hopefully, at least in the military world, it seems like hypersonics has that sex appeal that, going to the moon has for the general public.

[00:39:02] **AJ Piplica:** Yeah. Hypersonics has had its fits and starts and funding over the past, 30, 40 years, every, like I think it's 14 years, you see a peak or something like that.

[00:39:11] You had the national airspace plane I guess in the early nineties X 51 X 43 in the early two thousands. And then after each of those, you had some like pretty significant reductions in funding. And people ask that quite why is now different? And I think the answer is because there's a lot of other countries out there who are also pursuing the technology for similar and different reasons that we're finally seeing oh, Hey, Probably a little bit behind in some of these areas.

[00:39:41] If I look at just from a purely commercial perspective he or she who gets there first gets to write the rules.

[00:39:46] **Eric Lofgren:** Hopefully it's not, Xi [Jinping].

[00:39:48] **AJ Piplica:** Oh, interesting. Not that, that is, that is not what I was going for, but interesting. I see what you did there. Yeah, so you know, it it's pretty important.

[00:39:57] You look at the dominance of the U S and European aircraft makers in the commercial markets and they were the ones to get there first and they have a pretty strong influence over how the rules get written at the international level for aviation. That, of course they fight each other all the time, but what would the world be like without competition?

[00:40:16] **Eric Lofgren:** How about the like operational requirements that like the military is looking there'll be looking at you for? What do you think, like where do you see yourself? in

the future, if this comes together, like what, where are you fitting in into the military force structure?

[00:40:28] **AJ Piplica:** Yeah, so I think the obvious one that, that everyone would point to is airborne ISR intelligence surveillance, reconnaissance. That was the kind of traditional mission for the Sr 71. Obviously we're transitioning from operating from at least an air domain perspective from a mostly permissive environment to fairly contested and in some cases denied environment and our UAV fleets in general is mostly designed for the prior and not the latter.

[00:40:54] We've seen the implications of that even with less sophisticated adversaries than the China and Russia. We lost Triton to Iran not that long ago. Yeah, I think that's the big thing that, that pops in everybody's mind first.

[00:41:06] It's a couple of unique things that are quite useful around airborne ISR. That's done at very high speeds. Number one, you're relatively unwarranted. So like people will know that you've been there, but they won't know that you're coming. But if we're ability at high speeds is super important to be able to do that, cause you're not necessarily telegraphing or you're going So that, that kind of helps out in a place where space-based capabilities can be lagging sometimes.

[00:41:27] Synthetic aperture radar is super interesting for something like this because when you're flying super fast, you get a massive aperture. So it allows you to build like a broad area, synoptic coverage picture where you get a snapshot in time. So like when you're trying to count things on the ground, it's really hard to do that when those things are moving and your pictures are taken over a long period of time.

[00:41:46] So yeah, being able to, let's say image all of North Korea, 30 minutes Very useful thing. And in some cases other kind of collection things, geo, and obviously you're probably not gonna do too much infrared imaging just because your vehicle is super hot.

[00:42:00] Electro-optical sure.SIGINT, definitely ELINT people tend to turn on radars when fast things fly by. We used to do that at the Sr 71 quite a bit, but. Yeah. And then of course there's the long-term logistics and people moving pieces of, transport aircraft.

[00:42:14] That's a big part of the air force partnership that we have today, but things get pretty interesting. When you start trying to solve the problem with persistence. So one of the knocks on high-speed aircraft is, they can't deliver the persistent loitering coverage that we've become so used to and, over the past 20 years and that's by their nature.

[00:42:33] You can solve that problem then things really start to open up. But yeah, yeah, I think providing resilience as well for space-based capabilities most war games that we run today we've become very used to our space-based capabilities, whether it's communications or precision navigation and timing. Space is becoming more and more of a contested domain.

[00:42:51] And the ability to reconstitute space-based capabilities in particular geographic regions for short periods of time can be a massively valuable capability, especially if you

could do it quickly. So yeah I think when we first started out, we expected survivability to be the strongest metric.

[00:43:09] We talked about a little bit before, obviously we've leaned on stealth pretty heavily for survivability for the past couple of decades. But as radar's become more powerful. The pace at which radars are becoming more capable is much faster than the pace at which stealth technology is improving.

[00:43:23] So at some point they'll cross And the advantage that stuff has given us won't be there in the way it always has been. But speed and altitude and maneuverability are, other knobs that you can turn and the survivability equation.

[00:43:35] But I think what we've really started to understand is the responsiveness is really the key capability. Even if you're not as survivable as something that flies, maybe you don't Mach number two faster you, the ability to cover large areas in a very short period of time is huge, especially out in the Indo-Pacific region.

[00:43:53] It's an area that's characterized by very long distances and you have to live with the tyranny of distance and speed is a way to conquer that tyranny. .

[00:44:02] **Eric Lofgren:** So let's get into a. But what you guys are doing with the air force. And so this was a pretty big news. Recently, you guys actually received $60 million to continue development.

[00:44:12] And 15 of that came from AFWERX STRATFI program. And we talked with those guys about that program last year, and then another 15 million from air force PEO executive airlift. So there's the kind of matching funds that might be a transition partner. And then the rest came from private sources.

[00:44:29] To my knowledge, this is actually the biggest air force stratify from, AFWERX that they've done yet. So that's a pretty big deal. Can you just talk about like your decision to go through the AFWERX process and then, what was your

[00:44:40] **AJ Piplica:** experience? Yeah, I think the changes that we've started to see led by AFWERX in the air force and other organizations in the other services to become more open to working with non-traditional companies.

[00:44:52] That was also another reason that we figured. After we started the company that this was happening, I was like, so maybe it was just luck, but it's definitely refreshing to see folks really trying to change how the system works here. So, Yeah, it's been a fantastic experience working with the folks at AFWERX and and in, in executive airlift and other kind of other PEOs and CEOs within the air force that has been a part of this initiative.

[00:45:16] I think if we tried to do something like this five years ago again we'd be probably be trying to work for, another phase II SBIR or something like that. But I think having the experience that myself and my co-founders had in the past at a previous company we'd taken a single phase one SBIR , it turns it into 10 plus million dollar development effort.

[00:45:35] And that was pretty eyeopening that, that could happen. But I think bringing in the end user community at this early, early, early stage, like even when, we we want our original phase two SBIR the end user was a huge part of that and understanding what their operational needs are.

[00:45:52] Where the problem set is, was really important. Right off breath of that.

[00:45:56] **Eric Lofgren:** Great. So you talked about like you wanted to solve problems early basically. And along the way, because this is going to be a big issue, right? One analyst said, the $60 million is like one, one step in a journey around the world, can you react to that?

[00:46:09] But then also, what are you supposed to actually do with this funding? Are you like onto deliver something for, the government contract and then what do you think about next steps? Yeah,

[00:46:17] **AJ Piplica:** it's definitely a fair assessment. The vehicle only flies a couple of hundred nautical miles, so yes, about a step around the world.

[00:46:24] But you have to start somewhere. Yeah, the way the program is structured, all the design development, fabrication, everything, that's all happening on private funding. That's basically stuff that we were doing anyway within the kind of $30 million government contract the things that we're delivering are test reports, test data, test plans and things related to the ground in flight test activities that we're doing.

[00:46:44] So that was I think a really important setup for how that contractual mechanism worked. Being able to design, develop and fabricate outside the FAR [federal acquisition regulation] was huge. Like that would have had a very significant impact on our business. Even at a. Far part 12, that contract. The key deliverables that we've got are yet focused on the ground of flight test activities that we're doing on the engine, on the aircraft.

[00:47:07] And then of course, as we put them together and go and try and get up to Mach five and get back. I think if you compare the results that will come out of this program for the air force to previous hypersonic flight programs it's pretty valuable effort. You're probably an order of magnitude lower cost than any set of hypersonic flight test data.

[00:47:27] For a new air breathing vehicle like this in the past, I think, like X 51 was 350 million or so. So yeah, it, I think it's a really big value for the air force to have access to the data that's being produced here. And for us, frankly, we want them to have it too.

[00:47:44] Cause it's going to really help inform what the next steps are for the development of the technology for able to prove what's possible. Hopefully it gets a lot of other folks trying it too. So yeah, as far as what's next once a quarter horse development is complete it will have a capability that no country in the world has.

[00:48:05] And we really want to leverage that as much as possible to, advance whether it's everything from fundamental science, 6 1 6, 2, all the way through to, getting. Tech, that's going to go onto an operational system from, TRL four or five up to six or seven by putting out a vehicle, it's going to get it into the environments that that it will eventually see.

[00:48:24] Yeah, we've see a pretty strong set of use cases just for a quarter horse in and of itself. For us though, we didn't start the company just to, just to do flight testing. Yeah, that's something that's really only come along recently. We want to be flying that aircraft as much as possible.

[00:48:38] It just, like I described with space X in the early days or in the early part of the conversation That we're doing is generating data. That's going to help us improve not just quarter horse and its engine, but the next aircraft that we build to scale up to the scale of engine, that'll eventually go into a passenger.

[00:48:55] **Eric Lofgren:** Yeah. This is one of the things. So like you're on contract to really deliver information to them about the what's going on in your tests. They, it reminds me of Armen Alchian , who realized this in the fifties, he said R and D is not for building like operational equipment that you're actually gonna use. It's for buying, knowledge and options of what will actually work in procurement and, giving them the optionality to develop that.

[00:49:18] So it's interesting. Hopefully the government can come along in that in a more robust manner looking at it, like you're really buying information RDT and a, you're not buying, things that have to be like equipped in like fielded and all that stuff. But you need the transition, of course.

[00:49:32] I wonder you said, you wouldn't be able to do the actual development, so they're helping you fund some of the test stuff and then they get some of the information from the test, but you're doing the development and kind of the systems engineering, that's all you guys. And you said, we wouldn't be able to do it if we kind of had a far contract, so there's lots of issues.

[00:49:48] You would have to predict exactly what you're going to do. It would be too slow. It would force you into these silos within your company. Like what is it exactly going to

[00:49:56] **AJ Piplica:** happen? There's a supply chain implications. There are lots of

[00:50:00] **Eric Lofgren:** buy American, is that?

[00:50:01] **AJ Piplica:** No, not that one, but there are lots of suppliers out there that we work with on a regular basis who can manage export control information, but have never been on a government contract before.

[00:50:11] So if I'm going to go flow down a far clause to a machine shop that not taking up a huge amount of their time it's going to be, it's going to be difficult to effectively do business on a a schedule. That's relevant to what we need to be able to do.

[00:50:24] **Eric Lofgren:** So how about Pricing?

[00:50:26] Do you have any kind of pricing challenges, this early in the development process? Because a lot of times, Fixed price contracts. It's you need to define what exactly the way it is you're going to provide, but I guess you're just like they're ordering, test data or like,

[00:50:37] how'd you think about pricing in

[00:50:39] **AJ Piplica:** this early stage? Yes. I mean, It becomes really difficult. I think if I were king for a day, I would definitely expand the ability of contracting officers to leverage pricing justification over cost justification for things like this. Cause the analogy that I just gave, if you just look at what the government paid for the X-51 program, which at the end of the day the products were test data.

[00:51:00] Yes. They built a few aircraft or a few vehicles. But they were expendable, they weren't delivered and used again. The things that were, that came out were reports and data. And not that we're doing exactly what that program did, but I think you can look at the two programs next to each other and say, yeah, okay.

[00:51:18] This is, I'm not flying at Mach five for five minutes, but it's taking a new engine. It's going to build a couple of different, a couple of different iterations of the aircraft. And it's gonna generate a lot of data. It's going to be a lot of flights. So I think like you can just do that, look at those two things and say is this for 30 million a good value or not?

[00:51:35] But unfortunately the government's not set up to contract that way. Unless you've got established commerciality you basically have to go through a cost based buildup to justify the pricing which, for me as a commercial company, that I don't really like that. You know, thankfully.

[00:51:52] The fixed price effort. The the cost accounting standards in everything on the far don't apply, which is helpful. But still, I think it sets up an incentive structure that does not push for reducing costs and delivering great capability at the end of the day.

[00:52:06] And that's, something that I think we're going to, it won't just be us. But plenty of others will continue to bump up against as a challenge going forward. If we're able to deliver hypersonic aircraft for $10 million, Why should you care what the profit is on it?

[00:52:23] **Eric Lofgren:** The contracting officer still has the requirement, right? I guess it's like, if you can deliver a hypersonic aircraft for $10 million, then it's any Joe blow can just be like, all right, obviously that's a value. But there's probably a point like where that number is like, well, I don't really know how much it should cost.

[00:52:40] How much should I pay? What is fair in this case? And so that kind of like bogs back down into these cost justifications, so you're still dealing with those. Oh,

[00:52:48] **AJ Piplica:** we're good. No, it like it took us a while to learn through. I've never done a contract of this scale of this type.

[00:52:54] I've done others in the past. So thankfully I had that experience to go through this. I would not want to go through something like this for the first time. Uh, It was like my first government contract. But no I think it, it takes a lot of iteration. You really need a partner on, on the other end.

[00:53:08] Both in the program management side and in the contracting side, people who are understanding how this is a very unique type of mechanism that, that most people are

not used to given that there have been what, like 20 of these so far, most of them last year of the STRATFI. Exactly. It's a different construct.

[00:53:25] And yeah, you just need people who are willing to sit down and get down to brass tacks. Think from first principles. Obviously, within the balance of what the regulations allow, but Yeah. Yeah. It's definitely an opportunity to be creative.

[00:53:35] **Eric Lofgren:** Would you ever take a cost plus contract

[00:53:37] **AJ Piplica:** as a dangerous question?

[00:53:39] I think, let me put it this way. The way we decide whether or not to do something as a company comes down to two things, does it significantly reduce risk and does it significantly accelerate us to our end goal of accelerating the planet? The answer is yes to one or both of those questions. We're probably gonna do it.

[00:53:56] So applying that to a cost type contract I don't think we're going to be in a place where the answer to those questions is yes, for quite some time. When I look at how private capital is being leveraged within what we're doing here, a cost type contract with, eight, 10, even 15% profit on it.

[00:54:15] Doesn't pass muster with the type of scaling that we need to create to generate the returns that that our investors expect. Plus I go back to the kind of incentive argument that I made earlier. It's if we're not incentivized to innovate, make things work better and cost less to produce.

[00:54:35] We're not going to get to that long-term goal because there's a future here where we get very comfortable as a, a government contractor. And I think that is a kind of net negative to our end goal. What we're building in the national security space here. We're doing it.

[00:54:50] One, because I don't know, I feel a responsibility to do it given like our backgrounds and our capabilities and where we are in the world today. But it's also a step along the way to that eventual long-term goal and everything is aligned. Yeah, I think it's a it's it would definitely fundamentally change the way the company worked.

[00:55:07] Yeah.

[00:55:08] **Eric Lofgren:** One of the things I hear a lot from the new space company people is that-- what went wrong, like why was Apollo great and everything else not. And it was like they seem to like target this like cost plus mentality. And I'm not really sure to what degree that is true or not, but there's definitely a lot of truth there in the incentive structures and then all the business systems and everything else that comes with it.

[00:55:27] Yeah.

[00:55:27] **AJ Piplica:** how do I want to state this analogy? If a given company needs to return a given number of dollars in profit to their shareholders, or to their investors, if you're doing it in a fixed price fashion versus doing it in a cost type fashion, the cost of your

customer is probably going to be less at the end of the day and the fixed price one, than it will in the cost type one.

[00:55:48] So that seems to me like the better world, assuming you're willing to take the risk on the company side to do it. And there's, there will probably be a scale where we're working at the first successful enough that becomes a much harder question to answer. Now it's we, what do we have to lose?

[00:56:03] Like we, we believe in what we're doing and believe in ourselves and if laid out a plan to go execute and we're going to do that. But that becomes a much harder kind of built a pay as things scale up and get larger and the stakes keep getting race. Yeah, maybe there's a, maybe there's a state where that starts to make sense, but I think when you've got acts like really strong access to capital to give you the financial capacitance that you need to do things the right way.

[00:56:28] I so long, as long as that continues to be there and continues to scale yeah, I. I doubt that we'd go coat down a cost that route, given the choice.

[00:56:37] **Eric Lofgren:** And uh, going along this route, what advice would you actually have for other companies that are trying to break into the defense market?

[00:56:44] What would you tell?

[00:56:45] **AJ Piplica:** Yeah, so I'll, answer it from a kind of venture back startup type perspective versus a a small business. I think working with the government has to be a really important part of your strategy. If you want to work at the government for, 10% of your revenues It's probably not going to be worth it.

[00:57:03] Mostly because you're not going to be willing to invest what you need to invest to actually get it done. you know, Whereas for us where it's an incredibly well aligned thing, that's very important to our overall strategic roadmap over the next decade. It of course makes sense to do it and, we're fully willing and ready to eat the glass that's required to get through that kind of stuff.

[00:57:23] And, cause yeah it's not easy and you definitely have to make some pretty significant investments internally to get it to work. I think it's kinda hard for for some startups to, to be able to do that when, the government is not a necessarily a big customer for them.

[00:57:36] But I think you're going to see more and more startups that are focused on these dual use technology areas where the government would embark it does play a big role especially early on. So I think that's going to continue You really have to build the relationships that are necessary to work through and sell programs like this.

[00:57:52] It's not something where you can just reply to an RFP that's out there on the street that it's usually too late at that point. But like you need number one to establish the credibility for your organization within your customer set. And that that takes a lot of time. And not, it's not just like you're out there talking to them all the time.

[00:58:08] You have to continuously make progress along the way that you're continuously updating and updating and breaking their mental model for what's possible. Like with the first engine that we built we had met with some DOD folks before we were even funded and were like, Hey, we're building this turn-based combined cycle engine.

[00:58:25] We're going to have it done in a year. And they were like, We'll see, come back with the data. So nine months later, we did it, knocked on their door, showed the data. They're like, cool. You guys do what you're say, you're gonna do this refreshing. Yeah building the building, the credibility for the company, the organization, the people and it like, it changes as the company scales, like we're now constantly doing something we've never done before and we have to keep upping the ante on the credibility side.

[00:58:49] You also need those internal champions who are gonna, run the halls whether it's, the Pentagon or over the lab to, herd all the cats that are necessary to build programs. You can't do that fully from the outside. So you need that internal advocacy. And then again, that's something that, that takes a lot of time and it takes a lot of trust, frankly.

[00:59:05] People really have to make a bet on a new company like this and, to some extent their futures and our futures are intertwined not fully, but yeah, there's definitely a connection there. Yeah, you need people willing to take the personal risk to do something like that.

[00:59:19] yeah, and obviously you have to build out the internal team that's necessary. You need folks who have experience in working with the government who understand the, I'll put it this way, who understand the physics of how the DOD world works from requirements and planning to acquisitions.

[00:59:38] You also have to understand how the PPBE process works and how Congress and the building, work together. Yeah, it's a lot. And you really have to be committed to it to make it work.

[00:59:49] **Eric Lofgren:** Yeah. So you said you had to make some hires what kind of who, what kinds of people, like what specific, like how many, or like .

[00:59:55] What areas are they doing? Are they BD people? And what other types of business systems or special things did you have to do that? If you were purely commercial, you just wouldn't have thought of doing

[01:00:04] **AJ Piplica:** for us. It's actually not too bad. There, yeah, so we we just hired our our first person who's full-time here in DC director of national cyber security strategy, Dan Kleinman

[01:00:13] **Eric Lofgren:** that was about at the 30, 30 person mark that you add that kind of special.

[01:00:19] **AJ Piplica:** Yep. About there. We work with a range of different consultants uh, in different places that kind of help guide us and help help build those relationships faster than

would otherwise be possible. That's super important. But in terms of like business systems having already built a small company that they worked the government regularly.

[01:00:36] We'd already seen a lot of what had to be done. So we built that into the company from the beginning working in an export controlled technology area already forces you to do a lot of that from a, just a cybersecurity standpoint. So yeah, there's obviously things or contractually obligated to do.

[01:00:48] But we'd already built all those things out anyway. And luckily not having a cost of contract helps cause we don't need a cost type or a DCAA approved accounting system in place. You don't have to go through all the actuals audits that you do for a cost type contract.

[01:01:04] So that's helpful. But yeah, I need a really good accounting team. That is that's used to that. Just in case. And then you need a really strong legal team that understands both contracting directly with the government as well as all the compliance elements that you need in dealing with the far.

[01:01:19] I think it comes down to like really understanding, each far clause, it's going to go into a contract. What does this mean for my business? And where are the lines in the sand that I'm not willing to cross? And then, there's some that you die on a hill for. And yeah, hopefully you can, you have a customer that's willing to work those through with you.

[01:01:34] I think OTAs are there for a reason. It's also very easy for folks that government side to just rewrite the FAR into an OT. They're not a panacea for everything. Like you really it's really about the people who were who are working them. So yeah,

[01:01:46] **Eric Lofgren:** if you could wave a wand and you could change one thing about the defense acquisition process, that would make it more appealing for people like you in the deep tech kind of commercial world, what would you say?

[01:01:57] **AJ Piplica:** Oh, man, I guess I already touched on a couple of these, so maybe I get more than one, but raise the reprogramming threshold. the ability to move money around to get up to the point where, a company is going through, $50 million a year. That's strong.

[01:02:10] If you can do that in, in, three to five years, you've got a chance to be very successful as a venture backed, dual use technology company, that's primarily working with the government. But, you know, the PPBE process better than most people. And it's not a trivial thing to go through.

[01:02:25] Working with the end user, understanding the gaps, building a requirement, getting it validated. Of course you don't want to get to the, the folks who hold the purse strings and forced down their throats. They have to be, it has to be something that they want that makes sense for them whether it's, within the services or within CAPE at the OSD level.

[01:02:40] And then of course you have to get Congress on board as well and ensure that the pitch and the catcher are there and everybody's on the same page. And, but yeah, no, I think

a little bit more fluidity in how dollars can be leveraged. I don't know how many times I've heard we got plenty of O&M funding, but I wish we could put some.

[01:02:57] Squeeze this into an R&D role. Yeah, I think if you're able to quickly get tens of millions of dollars on contract and ensure that obviously you're delivering that can be quite game-changing

[01:03:07] **Eric Lofgren:** amen to that. Any final things you would like to wrap up with here and then the last couple of minutes.

[01:03:13] Okay.

[01:03:13] **AJ Piplica:** I think you've, I think you've covered a lot of really awesome topics, really really enjoyed. It's not not too often. It gets a chat acquisition with folks and they listened to me without falling asleep. Good.

[01:03:22] **Eric Lofgren:** Awesome. J Piplica thanks for joining me on an acquisition talk podcast.

[01:03:26] Thanks Eric.

[01:03:27] This concludes another episode of acquisition. Talk, if you have comments, interview recommendations, or just want to chat, please contact us@acquisitiontalk.com. Thanks again. And until next time. .