Constellations Podcast

Episode 198 – Micro Satellites, Big Disruptors and the Trajectory of the Space Race

Speaker: John Gedmark, CEO and Co-Founder, Astranis Space Technologies – 25 minutes

John Gilroy: Welcome to Constellations, the podcast from Kratos. My name is John Gilroy and I'll be your moderator. Four years ago we hosted a guest who is preparing to launch a first-of-his-kind MicroGEO satellite the size of a washing machine, but small and mighty. Today we are inviting him back to share his thoughts on how the technology has changed and what's on the horizon. In a disrupted industry, new innovations and unique ways of thinking are more important than ever. Please join me in welcoming John Gedmark, co-founder and CEO at Astranis back into the fold to share with us his knowledge on changing MicroGEO satellite technology, new military applications, and the shift towards scaled GEO deployment. Well, John, welcome back. It's been four years, hasn't it?

John Gedmark: Oh, it has. Yeah, thank you for having me back.

John Gilroy: Four years usually isn't a long time in the satellite industry until the crazy amount of market disruption we have seen in the last few years. So what do you think is the biggest disruptor and why?

John Gedmark: Well, I mean if we're just talking about the last four years, I would say the single biggest change we've seen in the industry is actually on the US government side. We've been working now at Astranis for coming up on nine years, and we started the company with the same thesis, same thesis we're doing today, was the same thing we were doing back when we first started the company, small satellites for high orbits, that's geostationary orbit, that's some other specialized orbits up there, high Earth orbits or HEO, medium Earth orbit, MEO. And we just knew we could do some really interesting and valuable things and do that with small satellites that can be done at a lower cost. So that has all stayed pretty consistent throughout that nine years. But looking back over just the last four years, yeah, I would say the biggest single development has been the U.S. government and the U.S. military with Space Force really taking on this idea of what they call proliferation and disaggregation, and so moving towards larger numbers of small satellites.

John Gilroy: The last time we spoke a couple years back, you were just getting ready to launch the first of his kind MicroGEO satellite. Today it seems like all we hear about is LEO. Astranis, on the other hand is doubling down on the role of geo in

the space ecosystem. Could you share your thoughts on what characteristics of GEO that keep you focused on high orbits?

John Gedmark: Yeah, I mean, there's no question that we've been flying a little bit under the radar as you've seen LEO get all of this hype and excitement. But GEO has historically been and remains today some of the most valuable real estate in the solar system. There's really nowhere else where you can park a single satellite over a country or over a part of the world and provide this continuous service with just one satellite. And there's just so many things you can do there that are uniquely possible because of this special orbit that you're in. And that's where we see there's just a lot of value still to be unlocked. So being able to provide a dedicated satellite to a customer who wants to have their own dedicated satellite or really their own dedicated network, that is just something that we think we can provide and what we've seen with our customers that no one else can. And then you can extrapolate that to actually a whole variety of use cases where, again, you just have these standalone dedicated satellite assets customer by customer, each one getting their own thing.

John Gilroy: What are the key applications where small GEO satellites can make the most difference for humanity?

John Gedmark: Yeah, I mean, so it comes down to broadband connectivity for people wherever they want it, whenever they want it. And it also comes down, I think, to national security and you look at the needs that our armed forces and maybe those of some of our closest allies, what their needs are. And the world is a more complex, more dangerous place than it was just a few years ago, and so we see that as an important application as well.

John Gilroy: Is the MicroGEO still micro? I mean, please share with us some inside info on how the technology has changed over the years here. How has demand influenced that since our last interview?

John Gedmark: Yeah, we've been steadily making upgrades to our satellites and doing that across a couple of product lines. And I think the product maybe that you're referencing is we announced this new product called the Omega, and we announced the Omega last year and it's actually something that we've been working on for quite some time. So we've had an ongoing development effort now for a couple of years really working on getting to this next generation satellite design.

And what the satellite design, what it set out to do was get a dramatic increase in capacity, so call it 50 gigabits a second of total throughput, which is a lot for a single GEO satellite, into a small satellite form factor. And so this is still a small satellite. I guess you could debate whether or not they're considered micro, what is micro, but they're still in the same class as our first generation satellites.

They're a little bit bigger, maybe another 150 kilograms or so larger. But with that comes a massive step function in total capacity. And we saw that as that's just where things are headed. People need more capacity, they need it for a variety of use cases and they need it at a lower cost. And so we were just determined to just keep pushing the limits on the technology and really just continue to be the market leader in what we can fit into this small satellite form factor.

John Gilroy: John, I've read that the Omega version is slightly bigger than the first MicroGEO. So what are some of the key technology differences between these two?

John Gedmark: Yeah, so there's quite a few, and we had some of these technologies in work for quite a while actually, and just saw this opportunity to roll them in to a new design and really take advantage.

The first one is it has a much larger primary reflector, and we do that with a large deployable mesh reflector. And a larger reflector just means more gain for your antenna, which translates into more throughput, more gigabits a second for the same amount of power that you're putting into those signals, so more bang for your buck there.

Some of the other improvements that we've made, we are using an advanced solid state power amplifier of our own design, an SSPA, that has a number of advantages that go with that, I'm not going to quite go into all the details on that here. And then we also have done some improvements on what we call the spacecraft bus, including going to an all-electric propulsion system that gives much, much higher efficiency and increases the lifetime of the satellites. So adding a few years of lifetime, which can really make a difference in some cases. And there's more. So we've really seen quite a few opportunities to roll in the latest technologies into our design and use that to increase the end capacity for our end users.

John Gilroy: So what are the different ways that MicroGEO satellites can support military missions?

John Gedmark: Yeah, it's a great question because when you go and look at it, what maybe people don't realize is that almost all of the communications that our US military does today all goes over GEO satellites, it all goes over GEO. And the US military has a very capable satellites up there that perform this mission, but they are very large and very expensive and there's not very many of them. And so the US military, like everybody else, needs more capacity, they need more bandwidth and they need it yesterday. And so they're looking for ways they can add capacity to their system.

And then on top of that, they are looking for what they call resiliency. They want to know that ideally they have multiple ways that they can make sure they get connectivity to the different parts of the U.S. military, to the warfighter, and do that across actually multiple orbits and also do that in a way that is harder to put under threat. There really is a potential issue there if you are solely dependent on a handful of these very large, very expensive satellites that are up in GEO today.

And so what we've seen is that we think we can help, we think can help with the resiliency piece, we think we can help with the additional bandwidth and capacity piece, and then we can also help them by bringing new technologies to bear even faster maybe than they've been able to see in the past because we really are working hard to iterate on the technology and just bring the latest, whether it's anti-jamming technology or other types of things that they need, be able to bring that to bear for them faster than they've been able to see before.

John Gilroy: Yeah, with technology changing so fast, I can see how resiliency and flexibility are really top of mind for many of the military leaders. Let's switch over to some recent news. In a recent space news article just from December 2024, I read that you just launched four new satellites into space. Wow. One of the satellites in that launch has been described as the Swiss army knife of satellites. So what's with the Swiss army knife? Why'd you call it that?

John Gedmark: That is a great question and maybe first I'll just say we just could not be more excited about this launch, right? We went and we've been building many of our satellites. We went and bought our own dedicated Falcon 9 rocket for four of them to launch all at the same time together as a four-pack. You can just, I think, imagine the amount of work that goes into that delivering four GEO satellites together, integrating them onto the rocket, having them all launched together. We're actually pretty sure that that has never been done before, that a four-pack of identical GEO satellites all being shipped together, integrated onto a rocket together, launched and then importantly operated together.

So we had to go through all the initial commissioning, what we call commissioning, so the initial testing and checkouts of the satellites on orbit right after launch, doing that across four satellites all at the same time, it turns out that is hard. Maybe there's a reason no one had ever done that before, kept our team very busy. We have a few hundred people here who were very busy for a period of about a week, week and a half, literally working all hours of the day and night. So we had people in shifts. So there was always people up and working on these tests and checkouts of the satellites 24/7.

And I'm very excited to say it all has gone fantastically well. The satellites are doing great. And in fact, we just finished what we call initial commissioning of the satellites, so meaning we have finished all the subsystem checkouts and all the initial, not just tests, but also calibration so really dialing everything in and

fine-tuning a lot of the settings around things like the propulsion system. And that is all done, and so now the satellites are off and running on doing what we call the electric propulsion orbit rates. So they are doing a series of maneuvers using the onboard ion thrusters that we have on each spacecraft. Those ion thrusters are fired up, they are doing these propulsive maneuvers to start getting the satellites out of their transfer orbit and up into geostationary orbit. And so that is now happening as we speak, and we just couldn't be more excited about that. So it's just an incredible moment for the company, get these satellites up and have them all, check out through all the subsystem checkouts and everything and now be off and on their way to GEO.

John Gilroy: I went to YouTube and I looked up Astranis and saw, talk about excited employees. They were jumping up and down, there was champagne. I mean, they've worked on this for six years, day and night, and finally they succeed. They're really happy, aren't they, they're really excited about this?

John Gedmark: Yeah, we're pretty excited about it. It's been a fantastic time and just could not be more proud of the team that was able to get these satellites built, shipped out the door, to the rocket and now get them up and operating on orbit. And yeah, we're just very excited about what comes next.

So we call it the Swiss army knife of satellites because it actually has multiple frequency bands and can switch between those different bands. So it has KU band, it has KA band, and it also has Q and V bands, and Q and V bands are very new, this is a set of frequency bands up in very high frequencies, 40-50 gigahertz that is really not used much by communication satellites today. So we're doing that really as a proof point that we can do some interesting things in those higher frequency bands.

And so what we have is a satellite on orbit that we actually are using for a series of short-term missions so we can relocate it, and in some cases I think we'll be doing that in the future on rather short notice. So we have an initial customer, which is in Mexico, so an internet service provider there. We'll be there for the first, maybe about a year while we put up actually some additional satellites for them. And then that satellite will be released and we will go and take it around the world, and we have a couple of other interesting shorter-term missions for that spacecraft, so stay tuned on that.

But that is just an interesting thing that no one has ever done before, demonstrating you can put this satellite up. It's very adaptable, very flexible, we have a software-defined radio on board so we can reprogram the radio on orbit depending on exactly what it's being used for and then showing that we can move the satellite around and do these different missions for different customers in different frequency bands. It's just something that no one has ever done before and we saw an opportunity to do it, put a few things we were working on on this one satellite and just go and do it.

John Gilroy: Yeah, flexibility there. I guess if we look at this launch and put it in perspective, I think you have now launched more satellites to GEO than any other GEO operator in the last couple of years. So what's your secret to achieving the success amid the competition from LEO constellations?

John Gedmark: Yeah, so I think first of all we set out with what ended up being a great product and a great offering for the market, a great offering that customers just couldn't get anywhere else. So we've had a lot of great customer success with the small GEO concept, and that product, that translated into orders, signed contracts with customers, and that gave us everything we needed to go and raise capital and go start building larger numbers of these satellites. So we really are now spooling up our production in a pretty big way. And just when you do the numbers, that means that we are going to be producing more of these satellites and launching more of these satellites than I think the rest of the GEO industry combined.

And I think it is just a sign of things to come. Everything is moving to these smaller satellites, they can be built faster, launched faster, launching multiple of them on one rocket, they have a lot more flexibility and it's just we're in a different world now. It's the world where you sort of put all your planning and all your eggs in one basket of one large GEO satellite and it takes years and years to put up and that's just sort of it. I just think the world is moving too fast now, we need more flexibility than that, our customers need more flexibility, they need to move faster, they need the latest technology, and I just think going to smaller satellites that we can build more of them and launch them faster, it's just the key and I don't think that's going to change.

John Gilroy: Well, you mentioned the word production, I want to maybe focus a little bit on production here. Many satellite manufacturers making software-defined satellites are encountering production issues resulting in multi-year delays. Are you experiencing any of these types of issues and how can you mitigate them?

John Gedmark: Look, having a fully software-defined satellite payload and being able to do this digital processing across many gigahertz of bandwidth simultaneously, it is a hard thing and it's something that we knew we needed to develop that technology, we knew in order to really realize our vision as a company, we knew we had to have that. So we started on that in the early days of Astranis almost from day one in kicking off that development. And it just takes time. I mean, we've been at it for nine years now. I think really it took the first several years of that just in sort of this R&D and development mode in order to design that, develop it, prove it out, do all the testing we needed to do. And so I think for any satellite manufacturer or company that's seeking to do the same thing, I think they'll find that it's similarly challenging.

And it's such a leap from what they had done previously, right? It used to be that these big satellites were really just purely analog, meaning there's no digital

signal processing happening of any kind. All the electronics are analog. It's a lot simpler, it's a lot easier to build. And also that's just what they had been building for a couple decades now. And so going to this digital payload that has the software-defined capabilities in it, it is a pretty big leap. And so I think people are just seeing what we saw when we did it back when we founded the company back in 2016. So no real surprises there. I think it's just anybody is going to encounter the same challenges just because it is hard.

John Gilroy: 2016 to now, it's almost a decade, all the success you've had. So what is your best advice for other space startups coming into the scene?

John Gedmark: Yeah, that is a great question. I would say number one is space is hard and it is a marathon, not a sprint. So you really got to build for the long term. And I think that is maybe easier said than done. Where that becomes challenging is, well, the investors expect you to show progress on these one year or maybe 18 month steps, and then that's when they decide whether to invest more money or not. And so you have to both simultaneously take this super long view while also coming back and figuring out what you can really accomplish over the next year, year and a half to justify the business in your conversations with investors. That is a hard thing, but obviously it can be done, you got to really think it through and really try to plan that out and think it through as early as you can in the company's life.

John Gilroy: Well, John, what do you think is on the horizon for the satellite industry five years from now?

John Gedmark: Yeah, that is a great question. I mean, I think we're going to see a continued trajectory on more smaller satellites in every orbit. And of course people have already seen that in LEO, in low Earth orbit, so I don't think that's going to surprise anyone. But maybe they will be a little surprised by how much that is going to happen in GEO and some of these other high orbits. That is going to happen. And then like I said, because we've been a little bit under the radar with GEO and these high orbits, maybe it'll catch people a little bit off guard.

The other thing that I expect to happen is a continued, there's no other word for it, space race with China. And that is a huge, huge deal right now. You could go back and look at China's launches over the last few years and they have done more launches of more space capabilities than any country on earth, including in the United States, right? It's like you can put these things in three buckets. There's Starlink, which is just sort its own bucket. You have China and all the capabilities that are launching across everything you can think of, comms, remote sensing, human space flight, their secret space plane. I mean, all these things. And then everything else the United States launches across all our capabilities. And China, they've been ahead. I mean, they've been launching more things, they've been moving faster.

And it also has a lot more of, unlike the last space race with the Soviets, with China, they are really pushing hard in a military way, right? I mean, the military flavor of the space race that they're creating is much more so than what we had with the Soviets. And it's really a stark contrast there. So I think we are going to see that space race continue to play out, and again, it will be in a much more military-themed way than we've seen in the past, and so the United States needs to make sure we respond to that and move quickly to establish our own capabilities, and I think continue to offer this real deterrence against any kind of actual conflict breaking out in space. Nobody wants that, and certainly no one is going to advocate for that. It really is all about deterrence and having the right capabilities up that will hopefully keep our adversaries from being tempted to turn space into some kind of battlefield or something.

But that is something that I think we'll see play out. And that is, again, across all orbits. That is LEO, that is GEO, that is even up in cislunar space. China has really been leaning forward on what they've been doing around the moon, and that is territory that we cannot cede to China or to anyone. The United States, we have to be number one and so we have to be number one not just in the parts of the space domain that we have historically dominated, but we have to continue to be that and be that up in cislunar and all the rest. So we've got a lot of work cut out for us there, and I think it's going to be an exciting next few years.

John Gilroy: I think you've given our audience a real great idea on innovation in the area of GEO. Now I'd like to thank our guest John Gedmark, co-founder and CEO at Astranis. Thanks, John.

John Gedmark: Ah, thank you very much.