Constellations Podcast

Episode 145 – Future of Satellite Connectivity, New Satellite Applications and Other Key 2023 Space Trends

Speaker: Sita Sonty, Partner and Associate Director, Boston Consulting Group – 25 minutes

John Gilroy: Welcome to Constellations, a podcast from Kratos. My name is John Gilroy and I will be your moderator. Today's interview is the second episode of the new year. We wanted to take our crystal ball out and look at some of the trends we think will be key in 2023. What technology will play a large role in the current satellite revolution and why? To answer our questions, we've invited an expert in the industry, Sita Sonty. Sita is a partner and associate director for aerospace and defense at Boston Consulting Group. Sita has an extensive background in commercial space, having worked for companies like Raytheon, SpaceX, and Sierra Nevada. Before these roles, Sita was a foreign service officer at the U.S. Department of State. Sita, I've done over 1000 interviews. I've never interviewed someone who speaks Croatian, Arabic, and French. I mean, this is a first, isn't it?

Sita Sonty: Well, thank you. I would say in the foreign service, it's actually really inspiring to see how diverse the experiences and background and cultural knowledge tend to be and what resources are made available to us as diplomats so that we can be good at our job. So I credit the State Department for investing very heavily in me and in the diplomatic phase of my career.

John Gilroy: It's perfect for the Constellations Podcast because we have listeners all over the world. So let's jump right in and give you a hard one to begin with here. So I read a paper you co-wrote for the Boston Consulting Group that states that connectivity creates value and satellites are the future of connectivity. Can you elaborate on that for our listeners?

Sita Sonty: Absolutely. So one of the main takeaways that I think we all can align on during COVID was the importance of the value of constant connection, not just in the literal term of being connected to each other as individuals, but the need for technology to enable that kind of connectivity, whether it's through Zoom based podcasts like this, or it's an automatic operating tractor-trailer in a remote rural location somewhere around the world. That tractor-trailer needs to absorb data. It needs to process that data. It needs to actually then have an informed decision-making capability to say, "Do I put more fertilizer in this square meter? Do I put more soil in this square meter? At what point do I need to change it?"

That data requires a constant connectivity that we believe is increasingly the trajectory for a number of industrial goods companies and this is of course an example in the agriculture sector. It's really inspiring to think about the likelihood that a farmer is going to be starting the day, not by climbing into his tractor-trailer, but by logging onto his laptop and trying to identify those data sets, uploading them, updating them with the kind of connectivity that, frankly satellites are in the best position to be able to provide over time.

John Gilroy: That means conserving water and conserving resources. I mean, in the long run, it's a very good position to be in because the farmers need to conserve it all. There's a limited amount of land and lots of people here. Sita, I've also read that one of the largest growth markets for satellite connectivity lies in industries with connected vehicles. We talked about agriculture, but also cars and shipping. So why is this connectivity so important?

Sita Sonty: Think about it this way, the space economy is actually growing very rapidly, and there's a lot of interest in investing in it. In fact, there was a recent report that said the space market in 2022 was valued at about $424 billion, which is an 8% jump year over year. That is a significant jump given the overall capital climate, but a lot of that actually is driven by downstream revenue. What we mean by that is who are the players that are using space-based either connectivity from satellites along the lines of what we're talking about or other capabilities. There we're talking Uber, DoorDash, smartphone makers, telco providers who use space collected data and connectivity to provide services in unique and novel ways.

So what we mean by the largest growth markets for those industries with connected vehicles as agriculture, automotive, and shipping, is really a reflection that those remote connected vehicles are going to need to send and receive data. Are they sending and receiving to ground architecture or are they increasingly using satellites? The answer is they're increasingly using satellites. So the importance of preserving, establishing and protecting those satellite constellations has tangible evidence in the markets.

John Gilroy: Sita, many of our listeners, at least in the United States, have heard of DoorDash. But aside from these types of applications, are there others currently under the radar that you expect to see growing in 2023 and beyond?

Sita Sonty: Oh, definitely. I mean, this is part of what we get really excited about in the work that we do. I'm actually really excited about edge computing. So think about how much of what we have done in terms of data collection, storage, etc., as moving from ground servers to the so-called "cloud". Well, what we actually anticipate is going to be a growth application from 2023 beyond is edge computing in space. So those same satellites that are responsible for reliable transmission and receipt of data from the ground, we think are going to actually grow in responsibility for storing that kind of data. And that edge computing in

space has multiple benefits. Ultimately, it will actually be better for the environment because it will require less energy to power a computer processor in orbit with its proximity to other natural sources of energy such as the sun than it would be to power a said computer processor here on Earth. So when you require less energy, there's cost efficiencies, environmental benefits, and there's also just the fundamental economic long-term growth trajectory that we think is going to drive growth there.

John Gilroy: Well, we started off this conversation talking about 2023 and beyond, but let's go backwards. Let's look at last year. One of the biggest news stories of last year was the role of private satellite companies in Russia's invasion of Ukraine. So Sita, do you think 2023 will see an increase in government utilization of private satellite companies for possible military purposes?

Sita Sonty: Oh, absolutely. I think you saw those signals pretty clearly from the House Armed Services Committee and its markup of the NDAA last year. They took a very public position that the increased use of commercial space technology and the commercial use of satellite data and technologies such as synthetic aperture radar for remote sensing is just going to need to be the name of the game. There is a recognition, particularly here in the United States among government stakeholders in the legislative and executive branches, that the utility of commercial off-the-shelf capability, or COTS, capability from space provides agility, it provides increased access and it provides cost efficient solutions for government customers to have reliable access to data that is then secured and protected. You're also seeing on the supply side, the commercial providers, the private companies that you are referencing in the question, they're looking towards providing more reliable solutions with better cybersecurity. So you're seeing that dynamic on both the supply and the demand sides when it comes to government procurement of satellite services.

John Gilroy: Sita, earlier you talked about financial growth in a big fancy number in the billions, but let's talk about growth in a different area here. While non-geostationary orbit constellations are expected to grow exponentially in the next few years, creating new applications, opportunities and economic growth. Those thousands of satellites are also potential adversarial targets. So, what are some of the scenarios we expect to see to preserve, I guess, a peaceful space?

Sita Sonty: No, this is a great question, and as you can imagine as a former diplomat, one that's of great personal interest to me as well. The FCC just voted to establish a Space Bureau. Now that's meaningful. You've also seen an increase in the appropriation to the Department of Commerce that it will apply for the Office of Space Commerce. At the same time, you're seeing an increased level of meaningful activity by the FAA. Those are just agencies here in the United States who generally operate on the civil or commercial side of the house, but are playing this increased role in a robust U.S. government inter-agency effort to

agree on how we're going to take a leadership position and set responsible norms in space for the international community.

In addition to this, you have efforts that are being led by, for example, the United Nations Office of Outer Space Affairs, which is actually bringing together more than just the U.S. It's bringing together international parties to be able to expand those norms to say, "Listen, we are increasingly going to depend on satellites for connectivity, for automated vehicles, for tractors, for agricultural benefit, for economic benefit in segments that are much greater than the space economy itself alone." So we must actually preserve these artifacts, these satellites in a really meaningful way, and start to treat them as critical infrastructure. I think that shift, you're already observing in terms of not only the leadership and the resourcing here in the United States in the U.S. government, but increasingly among the international community as well.

John Gilroy: Now Sita, I'm on LinkedIn every day and they always have these little news blurbs. There was news maybe two weeks ago that talked about satellites of smartphone connectivity. It's on LinkedIn, I mean this is everywhere. It's going to be discussed at the 7-Eleven, they're all talking about it. There's been so much excitement of late with respect to the numerous announcements of Satcom to smartphone connectivity. While this could be a giant leap forward, there are several regulatory and technical issues that need to be resolved. So which in your opinion is the biggest of these hurdles?

Sita Sonty: That's a good question. I don't know if I would categorize one as the biggest of the hurdles, but I'd say there's a few of them. First of all, standardization. So standardization is this notion that all devices must interface with satellite connectivity capabilities in the same way, in a standardized way. That in and of itself is a challenge because think about how we're not even able to download all of the same apps through the same app store, whether we use a Samsung device or an iPhone device. So that's one of the, I would say topics that's really being addressed on both among commercial providers as well as the Satcom providers.

Separately, I'd say another increased area of focus in that discussion is really around whether 5G providers of telecommunication view Satcom as a threat or as a necessary strategic partner. That's also a debate in the industry that I think is ultimately going to end on the side of strategic partnership because at the end of the day, for constant connectivity. For that value to be created in all of the downstream segments of the marketplace, again, going back to what we were saying earlier, agriculture, Uber, DoorDash, etc., for all of that value to continue to be created, some services are going to need to depend on satellite connectivity or Satcom. Some will need to depend on 5G. So integrated capabilities that then deliver to your app on your smartphone will ultimately be important, we believe. I would say those are two of the major dynamics that are playing out. One is what does standardization look like? The other is how do we

structure the right kind of business models and partnerships between 5G, telecommunications and Satcom providers so that you can ultimately get that best benefit and that best growth for your customer.

John Gilroy: Sita, did you know we launched the Constellations Podcast back in 2017? It was a small step for man, but a giant leap for podcasting. Today, thousands of people from all over the world listen to Constellations and thanks to you we've grown into more than just a podcast. Now, you can sign up for the Constellation newsletter at constellationspodcast.com to access original articles, podcast summaries, and contributed posts.

We just mentioned satellites and smartphones, and I've got to get to the tough part here. This is the nitty gritty of it all. Sita, do you think this technology is the catalyst that more than any other will blur the distinction between telecom and Satcom worlds? I mean, it's all coming together, aren't they?

Sita Sonty: Yes. In fact, that's exactly what we're starting to see, which is it's blurring the distinction. At the end of the day, I think about it as a customer, as a citizen of the world. If I'm in Egypt or Croatia or I'm on travel in Portugal or what have you, if I'm in one of these places and I'm utilizing my personal device for personal objective, do I anchor very heavily towards what's giving me my connectivity? If I'm in a plane and I'm leveraging the in-flight Wi-Fi, which heretofore has been pretty spotty on a lot of flights, those of us who are really dependent on it for work, am I anchoring to, is this being provided by a telecommunications company or a satellite company as an individual consumer? I'm not anchoring to that too much.

However, a lot of the overall market signals are actually driven by what we call enterprise customers, big businesses, big entities that want to amplify their level of connectivity so that they can drive the ultimate best experience for their customer. Those enterprise customers are increasingly seeing telco or telecom and Satcom as interchangeable. So are we going to end up in what we call a multi-orbit hybrid networked connectivity based world? My hypothesis is yes.

John Gilroy: Well see, we've been looking up to the sky for the last 15 minutes. Let's redirect our vision down to the ground. Sita, we've been discussing satellites and applications. Perhaps we should turn our attention to the ground systems that are also undergoing significant change with digitization, virtualization, and orchestration. We often read about satellite technology's impact on the ground, but how do you see new ground systems impacting the satellite technologies?

Sita Sonty: This is a great question, and it's funny because I always like to stay grounded, especially when talking to my kids. One of the things about ground architecture that I always anchor to at a very fundamental level is Earth is a finite resource. Access to terrestrial capability, it's still a finite resource. Orbital access is also

finite, but it's not as finite. As a result, what you're seeing among the establishment of new sites, for example, for ground stations or the increased productivity of existing sites where you might see existing ground stations, either way requires an investment, but it requires what I would describe as a cost efficient investment that takes into account things like ESG. It takes into account the implications that it has for the terrestrial environment. It must also take into account the fact that greenfield exercises, which is a term for I have a brand-new plot of land, and I'm going to have to start from the ground up, pun intended, versus leveraging an existing site.

Those choices or trade-offs really are evaluated by investors in a way to say, "How do we leverage this and extract the best benefit while still preserving the environment in that place?" You're just seeing that the importance of environmental protection, both for ethical reasons but also for economic reasons. It's just taking more precedence than it used to, I would say 10 years ago. So when you think about how do ground stations really impact the expansion of the satellite capability, if you will, it's just being done in a more responsible, ethical and environmentally focused way.

John Gilroy: Now Sita, earlier I referenced a paper you co-wrote for the Boston Consulting Group. I want to bounce back to that paper if we can here. In that paper, you discussed the growing demand for multi-orbit satellite terminals by both the commercial and military sectors. Now, in a report about the ground segment, Euroconsult recently identified multi-orbit, multi-constellations terminals as a key condition for continued growth of the Satcom market. So what is a multi-orbit terminal and what value add do they bring to the satellite applications?

Sita Sonty: Excellent question. So think about devices that we have in our homes like a smartphone or a laptop. Think of the rough equivalent of the device that is embedded into, let's say your car or a tractor or an airplane that sends and receives signals. At a fundamental level, that's what it does. But is it sending and receiving signals to satellites in geosynchronous orbit, in lower earth orbit, in highly electrical orbit, and/or is it sending and receiving signals if you're on the ground to cell towers at the same time? The ability to send and receive signals on different wavelengths or radio frequencies, two different orbits and/or two cellular towers on the ground is what we mean by a multi-orbit terminal.

And what's interesting is when you think about embedding that terminal, think about the radio in your car, utilizing radio frequency. Sometimes those signals get a little spotty. Sometimes we hear the scratching. So when you think about reliable connectivity, you want to minimize the signal to noise ratio that actually ends up getting transmitted to that terminal. And to minimize that signal to noise ratio when you're dealing with multiple orbits is a pretty impressive engineering feat. So that's really what that means, is the engineering is really advancing in a meaningful way so that those terminals are, for example, ruggedized. You can use them if you're in a Jeep in rough terrain. You can use

them to send signals to satellites and to cell towers at the same time, and they're really being refined to maximize leverage of access to that frequency. But frequency is also a finite resource. So that's also one of the trade-offs that we're seeing in how those terminals are being designed.

John Gilroy: Sita, I speak with a lot of cybersecurity professionals and there seems to be an unwritten mandate that every 15 minutes, you have to use the word artificial intelligence. So we've got to use it here, it's mandated. We don't have a choice here. So it applies to this discussion too. We did a podcast not long ago where a guest stated that AI would be critical to managing the explosive growth of cat satellite constellations. What are your thoughts on artificial intelligence in this satellite world?

Sita Sonty: It's so important, and it's not just important, but the kind of solutions that are being generated by AI are having immediate impact, I would say, as opposed to futuristic impact. For example, things like predictive weather modeling depends on artificial intelligence. For example, the ability to design or identify where space junk or space debris artifacts might be located in a particular orbital place, and then model where and how they would have to be moved, that requires artificial intelligence. For example, autopilot maneuvering, that will require artificial intelligence. And what I mean by autopilot maneuvering is imagine you're a satellite that's actually trying to avoid collision with a piece of space junk that might be coming in your direction. To predict when that collision would occur, to calculate the probability of the likelihood of that collision, and then to give yourself a set of instructions that says, "If this happens, and then at this level of probability, oh boy, I've got to move out of the way," as a satellite, absolutely requires artificial intelligence.

So you're seeing, since we were talking about the importance of protecting the integrity of satellites as we become increasingly dependent on them, we need to also protect their integrity just from a location standpoint and from a structural integrity standpoint. And that requires AI without question. So it's actually really big and having an immediate and meaningful impact in the space economy. But as I like to say, it still depends on the natural intelligence of really, really genius engineers in this industry that continue to inspire me every day.

John Gilroy: You just mentioned predictive weather modeling. Well, I'm going to put the predictive hat on your head now and ask you to look into the future of the next five years. What would you imagine would be the key issues we'd be talking about five years down the road?

Sita Sonty: Oh God, I love this question. Now you're asking me to be the predictive analytics according to Sita. Maybe instead of Siri, it should be me. Let's see. I actually think the one I just mentioned, where are satellites maneuvering well, I think that's going to be an incredibly important question, not just what are the dangers to protecting satellites that we depend on for, as we said, connectivity,

Earth observation, weather modeling, et cetera, but are they maneuvering well? I think that's going to be really important.

One that I actually think is also going to continue to grow in importance is donation states and global economies. Do they have equitable access to space-based technology? Because not every country can afford to manufacture a satellite or a constellation of satellites. Not every country has a company, a private entity that does sell on its own as well. However, the benefits of being able to leverage good weather data so that if there's a flood in Pakistan, for example, you know what the imagery is telling you, and you can put predictive analytics on it to be able to prevent harmful outcomes to citizens, is that access equitable? Access to space data and space technology, I think that's going to be a really important question. I think solutions are going to be designed around how to ensure that equitability of access.

And the third one that I think is super exciting, but this is a little bit of a personal bias, is human space flight. A lot of folks interchange human space flight with tourism, but it's not just tourism. It's about exploration. It's about conducting scientific research in space, such as what happens to cancer cells in certain laboratory environments in zero gravity, that has direct impact in how cancer treatment drugs are actually developed here on earth. That's just one of many examples that depend on human space flight and human space exploration. I think five years from now, we're going to continue to see groundbreaking outcomes from the scientific research that's conducted in orbit by the hands of, again, naturally intelligent, really inspiring humans. So this is one of the many reasons why I love working in this industry and learning from all the great technological advances that we continue to achieve.

John Gilroy: Sita, I'm thinking about how to sum up this interview, and I'm afraid the one I have to do is give a tip of the hat to Charles Dickens here, because what I think you've given our listeners is great expectations for 2023.

Sita Sonty: I love it.

John Gilroy: I'd like to thank our guest, Sita Sonty, partner and associate director for aerospace and defense at the Boston Consulting Group.

Sita Sonty: Thank you, John. Appreciate it.