

Introduction

00;00;00;08 - 00;00;34;27

John Soroushian

Hello and welcome to our third video on low Earth orbit satellites or LEOs for short. Today we're going to talk about LEOs and the digital divide. Many see LEOs as a major opportunity to help bridge the digital divide, especially in rural areas. Today, we'll be talking to a group of experts to help us better understand this topic and some of the important issues involved.

Let's meet our experts

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Michele Nellenbach

I am joined today by Gregory Rosston who is director of the Public Policy Program, and the Gordon Cain Senior Fellow at Stanford Institute for Economic Policy Research.

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Nicol Turner Lee

I'm Nicol Turner Lee, a Senior Fellow in Governance Studies and the Director of the Center for Technology Innovation at the Brookings Institution. My particular area — I have a forthcoming book on the U.S. digital divide that will be out in January 2024, and those issues encompass broadband infrastructure as well as artificial intelligence.

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John Peha

I'm John Peha. I'm a Professor of Electrical Engineering and Public Policy at Carnegie Mellon University. I previously served at the Federal Communications Commission as the Chief Technologist, in the White House Office of Science and Technology Policy, in the House Energy and Commerce Committee, and in industry as a CTO.

What are your observations about Internet access in the U.S. with regards to the digital divide?

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Nicol Turner Lee

I think the current Internet access picture in the U.S. is interesting, right? We had a pandemic that basically overlaid on the existing reality that in some instances, as low as 40 million people were disconnected. On the higher side, 100 million [people]. And this was before the pandemic reared its ugly head and showed us just how many people did not have access to online connectivity.

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Nicol Turner Lee

Today, those numbers are still somewhat stagnant. We still find that people who are over the age of 80, for example, have less access than those who are in the range of 65. Why I make that distinction is because it's really important for people who want to age in place. We also find that young families, or younger kids, have less access based on where they live, particularly if they tend to be low income living in an impoverished or urban area.

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Nicol Turner Lee

So, the digital divide is still here. It's just one of those cases where it's just become much more predominant in the public sphere since the pandemic.

What's new in satellite Internet and how does it address latency issues of geostationary satellites?

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Gregory Rosston

So, I think we've had this new technology over the last few years: low Earth orbiting satellites. Previously, satellite Internet was provided by geostationary satellites that were 22,000 miles above the equator. So there was significant latency or delay in the speed of which people got their Internet service. So you couldn't really hold a telephone call, have it going up and back to the satellite.

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Gregory Rosston

But these new low earth orbiting satellites are much closer. And the latency is much, much less. And so this has been kind of a revolutionary change that satellite technology can be used for Internet service.

What challenges exist in providing broadband to rural areas, particularly in the context of LEOs?

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Nicol Turner Lee

I think the topography of rural areas continue to be a challenge when we're talking about broadband access and connectivity. Deployment in large areas, particularly rural communities, require a clear line of sight. And we also find that some of the same topography that makes those areas quite beautiful and scenic are also the things that get in the way when we start talking about how we propagate the signals, particularly using satellite.

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Nicol Turner Lee

And so I think going forward is important for us to understand that in addition to the interference that may happen in space and the extent to which that debris may actually interfere with any type of clear signal that a person may be accessing for online connectivity.

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John Peha

What we know at the moment is the cost of one LEO constellation, not future constellations to come, and not how prices will change for that one. I think competition will be a factor that changes prices, but also the cost of equipment will come down as more people buy the stations that you know, the equipment that consumers have to have at their end.

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John Peha

And we will begin- there are more customers, they will better recoup the cost of the initial investment. So I expect prices will come down, both driven by competition and driven by these other factors.

What is the position of the government regarding subsidizing LEOs?

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John Peha

The government's position on subsidizing LEOs is changing under something called the RDOF (Rural Digital Opportunity Fund) program. A couple of years ago, the Federal Communications Commission put almost a billion dollars into LEO satellite services, and much of that money, in my opinion, would have gone to pay them to do what they were going to do anyway, which serves no value whatsoever. Then that particular decision was revisited. And going forward, the government is going to have to decide.

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John Peha

There's an important role that LEO satellites can play and where subsidies make a lot of sense. And then there are other places it makes no sense whatsoever. I hope government gets this right.

[Are fiber optic cables an inefficient option?](#)

00;06;16;13 - 00;06;53;05

Gregory Rosston

We replace electric lines every day. You know? we're going to have — fiber will not last forever. These fiber optic cables will deteriorate, the poles will fall down. Other things will happen so that it's not completely future proof. And it's a question of what are we going to need in ten years?

Well, if you think about rural areas that are under the FCC's plan and the [unintelligible] plan, my guess is that they won't,

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Gregory Rosston

there are a lot of areas that won't get service for 7 to 10 years. In the intervening 7 to 10 years, they could be on satellite and sort of what economists would say is what's the net present value in some sense of having something for 20 years? Well, if you have it for all of 20 years on satellite and only 10 of the 20 years on fiber, you might be a lot better off having a satellite service.

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Gregory Rosston

You know, ultimately, we might get to fiber for everywhere, but it's expensive. And we're using the same construction crews and other things that could be building roads or doing other infrastructure projects that we think are important for climate change, for example.

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John Peha

Low Earth orbit satellites can address the latency issue very well. That is their advantage over traditional geosynchronous satellites, which have terrible latency.

[What are some of the current concerns about deploying LEO satellite services?](#)

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Gregory Rosston

There are three or four satellite companies right now that are trying to provide LEO satellite service and there needs to be coordination among them so that we don't have collisions, so that they get the rights to operate at a certain elevation. But one of the other problems is we — that

already astronomers are complaining about the number of satellites in the sky and affecting astronomy.

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Gregory Rosston

So there are definitely what economists would call externalities from these things that may maybe negative externalities from having so many satellites in the sky.

[Can LEOs be leveraged for use-cases beyond commercial broadband deployment?](#)

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Nicol Turner Lee

LEOs can be very helpful to first responders. I'm thinking particularly in areas which are hard to reach or evacuate. And those areas where there may be some disjointedness between the existing networks, we could actually see LEOs again laid on top of that to bolster that connectivity. I think one of the areas that we need to explore more is how we can leverage LEOs for these use cases and particularly those use cases where we often consider this conversation of broadband deployment sort of allocated to commercial uses.

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Nicol Turner Lee

We should be looking around at some other large use cases when it comes to satellite, like climate, water usages, you know, wildfires. I think there's a lot of cases where we could actually leverage satellite technology to exploit our ability to do more drone surveillance and other public safety and climate interventions that we haven't been able to do thus far.

[Can LEOs address the digital divide? If yes, what are some of the considerations to be addressed for it to be a viable solution?](#)

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John Peha

To bridge the digital divide, the biggest problem in terms of affordability, I think, is going to be getting equipment to people with limited incomes to pay that monthly service or to pay that upfront cost. The basic infrastructure, the satellites themselves are presumably going to be there to serve wealthy users. The companies have strong incentive to build that.

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John Peha

But to actually serve consumers, they might need subsidies either on their monthly bill or to get the equipment upfront.

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Nicol Turner Lee

If we want to see LEOs actually impact the current digital divide and be a technology that can be future proofed to provide a service to people who often face the three barriers of availability, affordability and accessibility. This is an opportunity for LEOs to encase that space, but it has to come with some sensitivity that reducing the cost is important, ensuring that there's competition, particularly in areas where communities will be more reliant on satellite versus other technologies, working closely on other technical projects in collaboration with other technologies,

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Nicol Turner Lee

so that satellite perhaps cannot stand alone. I think going forward, the digital divide just requires an all hands on deck strategy. And if we can harness this technology in ways that we are harnessing other technologies but do it where it's more inclusive and better integrated, I think we're on to something. I just again, keep remembering my rides through rural America, seeing bigger satellite dishes in homes and thinking to myself in these impoverished areas, the extent to which we can reduce some of the burden from those families who need to be connected to improve quality of life.

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Nicol Turner Lee

Let's see this as another strategy going forward and continue to talk about ways to just not only remove regulatory barriers so we can reduce costs, but ways in which we can embolden consumers to see this as a viable option to get online.

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Gregory Rosston

So I think the technical hurdle, the first big one was having to launch a lot of satellites. The geostationary satellites can see the entire United States because they're so far up above the above the earth, the low Earth orbiting satellites can only see a very small piece of the country. So you have to launch a whole lot of these satellites and to coordinate them and to have the reusable rocket launches are two things that were critical to the development of the LEO industry and to have it work.

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Gregory Rosston

These are massive engineering projects with thousands of satellites orbiting the globe. I can't sort of say what the technical hurdles are, but from a regulatory perspective, there are going to be questions about what frequencies they can use and expand to provide greater bandwidth to have the — to coordinate the interference between systems so that you might have two different systems that both have constellations of satellites orbiting the Earth and trying to figure out who has the right of way is important.

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Gregory Rosston

And then finally, space debris. Because these satellites do not last forever. And so what do we do to make sure that there's not a lot of space junk out there?