Pierre de Vries: Conversation about what happened. What were your key take aways? What were the messages in your panel? I'll go down the table one at a time. Not only what you thought you heard that was most interesting, but what you didn't hear. What did we miss? So, David, you want to start?

David Reed: Okay. I have to note that I've never heard of CU parking tickets ever being waived, so, you have truly…

Pierre: Maybe we have the sponsors to thank for paying them, I don't know.

David: Okay.

[Laughter]

David: You're setting a precedent that's hard to match. Well, so, what one reaction, and maybe this is something that was discussed but wasn't, in the sense that, broadband, so, I do a lot of research in broadband access and the economics of different broadband solutions, and looking comparatively at the capital costs associated with the deployment of those systems. And, it's clear that for a lot of the NGSO systems, that they're being deployed as, for, broadband access, right? For providing that connectivity. They're differentiating based upon speed, latency, location. And that's a primary driver. It's not necessarily an application vision, that of a new thing beyond better speed, latency, a better broadband in different places.

And, that's interesting. Having looked at, so, I think there's still an opening here, some research that needs to be done in understanding comparatively, what are the advantages for these new systems, whether it's with LEOs, or MEOs and with the GEOs being more understood, but with high-throughput satellites changing the economics some. So, we really don't quite have a clear description of what the coverage gap is, so to speak, these systems are going to provide. And, so, there's some risk [00:02:00] associated with that.

Having done some research a little bit on comparing, in rural areas, some of the terrestrial wireless systems, such as LTE and wi-fi, wi-max, with high-altitude platform, in this case Google Loon, and looking at how those costs look. An early look at those economics do indicate that high-altitude platform, if they deliver on their promises, do, in fact, provide, what I call, a broadband onramp, in that there's not a lot of infrastructure that's required as compared to a terrestrial broadband system. And so, you can get broadband to some of these more rural areas, and emerging or developed countries, that the broadband isn't there, at a lower cost initially, in the earlier years. But then you want to transition over to terrestrial wireless systems as the speeds go above, say, two, four, six, eight, megabits per second. You need the terrestrial systems to deliver more broadband.

Pierre: That's still broadband. And so, one of the things that struck me, we heard this in the course of a day, which is, "General use is good, but I need spectrum for x."

[Crosstalk]

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Pierre: When we, are we unnecessarily fixating on broadband, that we're going to end up with rules and allocations that are good for broadband, maybe flexible use for broadband, but not anything else?

David: Right. So, it's interesting. There were calls for spectrum, right?

Pierre: Right.

David: Turns out that you don't need new spectrum in the sense, you can use LTE. And so, you can talk, particularly in rural areas, for example, LTE, spectrum, emerging country is not being used very intensively, so you might have 40 or 80 megahertz there, that, if you partner with the mobile broadband provider, [00:04:00] you might be able to have that spectrum available.

            And so, that, kind of, eliminates the need for the call for spectrum, and, by the way, it lowers the transition cost, because you're deploying LTE receivers, a termination devices, then you can transition to a traditional LTE system at lower cost.

Pierre: So, what I hear you saying is, to some extent, spectrum isn't a challenge. And, what I heard a lot on Anne's panel was that that's the big challenge.

David: Again, where's Tom? I don't know, yeah, so, the process itself. So, what complicates this discussion is the allocation, spectrum allocation process. That is, kind of, if you build something then others try to participate, and get some ownership rights. I didn't read the Intelsat filing. I assume it's associating some property rights that maybe they can trade, and get associated with, being part of the conversation. So, the spectrum piece, it's kind of a land rush, right? Gold rush that you want to be at the table in order to do that. But, for example, Google has been with the project Loon, and they've been talking about partnering with the local telephone companies, or whoever it is, and working with their backbones and system, and their spectrum, right? So, that's an example of them being able to deploy that. I think that's an interesting correlation that, certainly, if you had spectrum, it could be easier, but the LTE spectrum is typically lower. And what they're asking for is higher, and so, that might impact some of the economics. I've been look at that.

Pierre: So, let's move on to Anne, and we'll circle back if people have more [INAUDIBLE 00:05:53]

Anne Swanson: And my take-away is, such a much more general take-away, and I started in the FCC area, but, in the last 10 years or so, I really have [00:06:00] segued over to aviation safety, and the FAA, and DOT and, I've found in that field, just as in the communications field, and I'm not sure why I'm echoing, the tech is just so far out in front of regulations. I mean, it's just, you can't help it, and I've benefited, and I started in the avionics context when I crossed over to the FAA, I've benefited from watching some of the different ways they approach solving the problem.

And, in some ways, this has made it a little more cumbersome, but I think they've gotten to technical solutions, sometimes in a way that has had a more practical and beneficial effect through, what I mockingly called shadow government a little bit ago. But the RTCA process, which is a multi-stakeholder process, and I think your panels supports multi-stakeholder in a couple of different ways, but it's a multi-stakeholder process involving the technical folks, who are leading the innovative charge, and not necessarily the lawyers in this room, or even, I'm sorry, Tom, the economists. It's the guys who understand and the women who understand the technology, and working sometimes with groups like MITRE or others, the process is corralled and they come up with recommendations for the FAA, and these are highly specific technical recommendations.

But, it does seem to get them to a solution. I thought initially, it was terribly bureaucratic, but I think it gets them to a solution that works quicker, sometimes, than having the lawyers and the economists try to figure it out.

Pierre: So, are there any things that we, in the spectrum space can learn, so when you think about, FAA does this, how would one do that in the FCC context?

Anne: They've done that in the application of some of their psectrum real estate in avionics, and it's putting Julie's folks a little more in charge than I think they've been in the past. OET does a great job, but it's called in on an ancillary basis, usually to advise. And, I just see at the FAA side, and on the DOT side, and the technical spheres, it really is not an agency or department of lawyers as much. In the FAA, the Chief Counsel's office is over [00:08:00] on the side.

The lawyers aren't integrated into all the different substantive bureaus, the substantive offices. It's just a different approach to solving technically driven regulatory problems.

Anna Gomez: I know this isn't about my panel, but, if I could just add on to that? One thing that the FAA does very differently is it runs very quick processes through the aviation rule-making committee.

Anne: Which are another multi-stakeholder kind of thing.

Anna: Which is another stakeholder driven body to provide recommendations to the FAA. I think both Jennifers have, Jennifer Richter and Jennifer Warren, sorry, participated in the Drone Advisory Committee, and the remote identification and tracking advisory committee. But where we have seen the FAA do, is they convene these bodies. They give them very short deadlines. They tell them, "This is what we're trying to solve." Not, "We're looking to establish rules that do x. It's a goal that we're trying to resolve, and come back with recommendations." They've turned that into rule-makings, and they've turned that around. I think that that is a very quick process. It's not something the FAA -- FCC has done.

I've always, kind of, wondered about the APA implications of these advisory rule-making committees. [Laughs] Which is part of the reason why I think the FCC does do it.

Pierre: Could you just explain, briefly, what you mean by that?

Anna: What the APA is? The APA is the Administrative Proced…just kidding. It's the
            Administrative Procedures Act, but there's a question of how much notice and due
            process you are giving if you are limiting participation and developing rules to a
            particular body of stakeholders. I have not answered the question of why the FAA gets
            away with these aviation rule-making committees. They do, eventually, put the
            recommendations out for public notice, and create notices of proposed rule-making,
            unless, of course, they're doing interim roles as they did with the registration
            requirement. That's a different story.

            But, nevertheless, that is one way that the FAA does tend to do things more quickly. I
            don't think [00:10:00] the RTCA, the Radio…

Anne: Technical.

Pierre: Committee.

Anna: Advisory.

Pierre: Aeronautical.

Anna: Yeah.

Pierre: Shadow government.

Anna: Yeah, I actually don't think that is the most efficient body either. It's a standards process
            that tends to go on for a very long time, so much so, that the FAA has declined to use
            the RTCA to develop lower-risk recommendations. So, for the low-altitude flight, they're
            not going to the RTCA to ask for particular standards or requirements that they should…

[Crosstalk]

Anne: Technically, they don't need them I think, that's what's [INAUDIBLE 00:10:34]

Anna: For the, you know, protecting us when we're on airplanes, that's a very different story.
            That's where we really want those standards to be very well developed. But, in any
            event, I'm going on and on and that's not [INAUDIBLE 00:10:44] my panel.

Pierre: You've got comments on your panel, but let me just pick up this theme and I think it
            goes back to something Anne should be interested to hear, you as well David. For me,
            one of the themes of the afternoon has been autonomy. Dean Braun started off saying
            what's driving this size and autonomy. The systems are getting more autonomous, and
            then, as the day wore on, reality started setting in saying, "Well, we need autonomy to
            do all these wonderful things, but, boy, it's going to take 10 years. It's going to take 20
            years." So, to what extent is the technology ahead of regulation? Is regulation pre-
            regulating autonomy before we know what it is?

Anne:	Which panelist said autonomy is more a political problem? Was that you, Joe? I mean, I tend to agree with that. I don't think autonomy is a regulatory problem. I think it's a political problem.
Pierre:	So, a political problem in terms of perception?
Anne:	In terms of perception.
Pierre:	Right.
Anna:	Anyway, I think that that's right. It's interesting, watching autonomous vehicles progress, because they seem to be progressing with less of the public blow-back that, say, unmanned aircraft have. I mean, there's obviously concerns, and you hear about the guy in the Tesla who should not have been watching a movie, and died while he was allowing the car [00:12:00] to navigate.

But, that segment of the industry seems to be on a much quicker path to getting fully autonomous vehicles than we are with regard to the airspace. Now, what has really held up the airspace as, I think, both the first and the second panel discussed, was the security concerns, and that is, really, the lay of the FAA taking action. And the FAA is working on a continuum. Julie showed it on his slide during his remarks, which go from low risk to high risk. And so, if we do it step-by-step, then you're seeing a lengthy process before we get to full autonomy. |
David:	Yeah, so I think the question is the definition of autonomy. And, when we're dealing with these highly complex systems, autonomy can be defined in a number of different ways, for a number of different components. And, for example, when you talk about autonomous spectrum management, there are some systems that work that way, like wi-fi and the like, but there's a particular cost associated with the unlicensed band, and that there's potentially some issues associated with the quality of the service. So, I think, and we are seeing how autonomous comes across, and it sounds like it will work really well, and we're just reminded, today, on some of the so-called fake news associated…
[Mic issues]	
David:	Yeah, some of the fake news, say, associated with on Facebook and Google, on current news events, right? That's there's algorithms that just do things that miss the context. And, we will get the same thing associated as, Pierre, as you've gone through. You know all the different complexities, for example, [00:14:00] associated with the spectrum interference question, and how can we make that fully autonomous? I think…I'm not sure technology folks have solved that issue yet.
Anne:	But I think Dale's question was a good question, and I think that really needs to be balanced into any discussion of how we go forward with autonomy, because, at some point we do need human intervention when we have bad actors. And you could do a whole other conference. I mean, the one thing we didn't hear about today, too much, was drone security and counter-drones, and only now in the military context are you seeing those kind of operations and that kind of roll-out. And I think, local government is

at its wits end trying to figure out how to control drones, and I think we'd love to employ systems which the Feds just won't let them use at all today.

Pierre: Anna, do you have any more thoughts about take-aways from your panel? I know it's...you're still processing with Live.

Anna: Right. No, I have a few thoughts. Here are what I thought were the, sort of, top level things I came away with from our discussion. First of all, I thought our panelists were fabulous. I had this roadmap in mind, that we were going to talk about one thing, and then the next, and the next, and it just, sort of, went off on its own. But I still think, I feel like we touched on all of our subjects.

             So, first of all, lots going on already. So, we're talking about solutions. There are a lot of things going on already, a lot of multi-stakeholder processes. But, participation by all parties is important, and, at this point, it's not clear the incentives are in place to have everybody come forward with solutions. Hence, the discussion of the XPRIZE, and other ways to bring forward the parties.

             Second, we need more flexibility, to allow innovation, but, we must continue to consider our overarching goals. So, that's, sort of, a traditional balancing act. Spectrum use and allocation is getting more and more complicated, due to the proliferation of uses and systems. But, we should consider using market mechanisms to solve problems, even the sharing of spectrum. Finally, gigahertz is a word [00:16:00] and Faberge satellites are a thing.

[Laughter]

Pierre: Very good. Faberge eggs are a thing. You know, one of the things that intrigues me is, this question of flexibility versus the overarching goals. And, I suppose, you pre-answered my question by saying, "It's the traditional balancing act." But, isn't that saying, "I want to eat ice cream and not get fat." I mean, how do we think about that?

Anna: Yeah, I think, this is where being Julie is so hard, because once you have a system, once you've spent money, and you're operating, you don't want to be touched or affected. You don't even want the possibility of being affected by something new. But, innovation brings in something new. Now, say we're talking about cube sats, we're talking about the possibility of thousands and thousands of disposable satellites. That's all well and good until you've got somebody that wants to launch their satellites, or you're concerned about the space debris, and what's going to happen.

             But, the rules aren't allowing that, quite yet, although the FCC, of course, has started to relax some of its rules, and the NGSO rulemaking is a good example of how they're trying to permit these new uses. It's just instinctual that if you were the one that has invested in your system, you don't want it touched, and I think that it's important for the FCC to keep that in mind, while, at the same time, making the case for new entry and innovation. It's just tough.

Pierre:	And, it's also tough, I think, because people who are in the process of making investments, but have not yet launched deployed systems, use that as part of their pitch to the FCC. It's interesting, wave Tom's book [00:18:00], we've got wonderful history of a hundred years of mistakes. We're talking about new allocations. We heard about a number of them today, and I'm sitting there thinking, it sounds like the same old story, we're asking the FCC to make decisions about, you know, should this be for system a, b, c, or d, or, all three? I'm not hearing people saying, "Let's assign flexible use. Let's forget about overlays." Overlays is a fix for a problem that you already have. So, do market solutions help? Why aren't we using them?
David:	Tom was arguing for flexible use.
Pierre:	Yeah, I know, right. So, the question is…
David:	But that's the legacy, right? I mean, that's the legacy from the ITU rules that are splashing over in this space, like with HAPS. Get spectrum if you can, because the process allows for that in a particular way.
Anna:	I was going to say, it's one thing to talk about more flexible technical rules. It's another thing to talk about flexible allocations, when you're talking about satellites and space systems, because, then you've got the complication of the ITU. How do we meet our treaty obligations and our international systems while allowing more flexible allocations?
Pierre:	So, does that mean that satellite systems are a special reserve, untouched by market forces in the way that Tom is [INAUDIBLE 00:19:28]?
Anna:	That's what they would argue every time. [Laughs] Yes and no. I mean, there's the domestic implications. The question is, are you going to affect the international allocation in our obligations to other countries, and including, operators that are not U.S. operators that may also be operating in the same internationally harmonized spectrum? We heard a lot about harmonized spectrum today, and there's a great benefit to it, but it comes with this additional layer of complications.
Pierre:	So, let's just go down the table one last time. If there are any last thoughts or, if not, we can go and have drinks. [00:20:00]
David:	Well, I think one notion is that the application space is to be thinking that a lot of application platforms, so to speak, are now being formed by a deployment on these NGSO systems, right? And so, there is…it was raised, for example, Planet, and what they're doing with imaging. There are a lot of different ways that's being used. And, I think we're just starting to scratch the surface, I hope, for that. And so, that you will see a lot of these systems being used in ways that we hadn't seen before. It's hard to, kind of, state that up front and if anybody's got a good idea, they're not going to say, be ready to go public yet, but I think it established the way the internet, early on, with setting up a platform allowed for a lot of cloud-based services. We're establishing, maybe, some interesting new boundaries associated with space that could do the same thing.

Anne: And, I'm going to come at this from an entirely different perspective again, but I did hear risk-based rulemaking and decision-making pop up a little bit, and I, now that I'm more in the aviation world I find that risk-based decision making isn't quite the same option in aviation safety, that it may be in spectrum decisions. The FAA certainly has embraced the concept of risk-based decision making, but on adopting some basic rules, I think they don't necessarily use that as their test, but, then, when it comes time to waive those rules, I see risk-based decision making coming in. But, risk-based decision making, I would posit, is something that should be considered different in the communications and the aviation safety context.

Pierre: Because of safety of life?

Anne: Because of safety of life, yeah.

Anna: Yeah, I agree with that. One of the things we talked about today is the FAA rules that permit small, small unmanned aircraft flights that are part 107. There's a waiver process that permits longer flights…

Anne: And that's the risk-based process I was referring to.

Anna: Right, whereas before, the [00:22:00] way that you could get commercial authorization to operate a drone, it was through what was called an exemption process, or 333. Once the FAA got comfortable that certain types of flights were less risky, they basically started rubber-stamping every one of those applications. They're not doing that now, with systems that don't meet the exact requirements of unmanned aircraft. So, if you want to fly long-distance with multiple pilots, at night, you're going to have to make a showing specific to your system, specific to your aircraft. And, they're not going to say, "Oh, wait, we let this party do it." They're going to say, "You show me exactly how you're going to guarantee safety [INAUDIBLE 00:22:45]."

Anne: And, they won't yet waive that for package delivery, because there's a whole other economic permitting process involving DOT that we didn't even talk about today. That was one of the dogs that didn't bark, was that one. But, yeah, I wrote the first templates for those original exemptions, and it was amazing how I saw my typos duplicated down the road in what people were filing, and I was embarrassed I'd had typos, but they kept popping up over and over again.

Anna: But, that reminds me of a point that we didn't really discuss today, and that is the traditional satellite licensing regime is very system specific, in that, we would start with proposals for certain constellations, and we would build the rules around that. What the new challenge is, is to redirect our thinking toward, how do we allow these multiple entities to coexist with sufficient protections to mitigate problems, but without having to have complete carbon copies of proposed constellations.

Anne: Air traffic management has the same integration issue.

Anna: Yeah.

Pierre: One more sentence that has been too cryptic for me, is that air traffic management [INAUDIBLE 00:23:52]

Anne: Has the same kind of integration problem in a different regulatory context that she's raising for satellites, yeah.

Pierre: Very good. David, you get the last word if you want it. [00:24:00]

David: Nope.

Pierre: Well, we've come to the end of the day. Thank you very much, to the moderators. Thank you to all of you for being here. The lectures are going to be up on the website, [INAUDIBLE 00:24:14]. Thank you very much for coming.