CHRIS URMSON: Transportation underpins the whole economy, it's how we get around, it's how our stuff gets around. If we really wanted the roads to be safe, we would ban cars from them.

The Aurora Driver is this integrated platform. It's a combination of the software, the hardware, and then the off-board data services, that enable the vehicle to drive itself.

Today, there's a real need in the freight trucking space. We are short 60,000 drivers in America, and by the end of the decade, we're going to be short 160,000 drivers. This is the backbone of the U.S. economy. We think in the long-term, ride hailing is going to be an even bigger business than trucking.

When we think about scaling and growing the business, we really have to be building the company almost ahead of the product.

BOB SAFIAN: That's Chris Urmson, CEO of Aurora, the self-driving technology company that's slated to go public via SPAC later this year.

Tesla's self-driving efforts have been under intense scrutiny recently, but Aurora represents another wave of tech companies who are advancing an autonomous future in a very different way.

I'm Bob Safian, former editor of Fast Company, founder of the flux group, and host of Masters of Scale: Rapid Response.

I wanted to talk to Chris because autonomous driving has the potential to reshape not just the economy but societal habits.

Chris has been a leader of the movement for nearly two decades, from early robotic challenges to helping pioneer Google's self-driving efforts.

He's built Aurora to a more than $10 billion valuation in just four years, alongside colleagues from Tesla, Uber, and elsewhere.

Aurora's use of simulations demonstrates the power that software can bring to almost any business.
And there are lessons too around flexibility in business model – building a product that can apply to more than one market at once, and as Chris puts it, “building the company almost ahead of the product” to create an environment that can scale quickly.

As focused as Chris is on the safety of Aurora’s product, he is equally mindful of the need for urgency, which they encourage internally through the Rocket Award.

It’s a message about the dual priorities of high quality and high speed, priorities that increasingly define the entrepreneurial winners of today and tomorrow.

[THEME MUSIC]

SAFIAN: I’m Bob Safian, and I’m here with Chris Urmson, the CEO of Aurora, the autonomous driving company. Chris is talking with us from his home in California, as I ask my questions from my home in New York. Chris, thanks for joining us.

URMSON: Oh, thanks for having me. Really glad to be here.

SAFIAN: So let's just jump into this. Self-driving cars have been the stuff of science fiction, really, until fairly recently. Not that long ago, getting a vehicle to go just a few feet in the desert was a win. Today, there are a bunch of companies pursuing self-driving tech, Aurora among them. Recently we’ve seen the government launch investigations into Tesla's autopilot functionality. And so I wanted to start by asking you about how Tesla's approach in safety with self-driving cars and yours at Aurora, what's the same? What's different? If the invincible Elon Musk can't get the technology to work safely, why should anyone think about using it?

URMSON: Well, I think the big thing is this is a just fundamentally important problem, right? Transportation underpins the whole economy. It's how we get around, it's how our stuff gets around. So we need the technology to work. As we approach it, we take a safety-first mindset. We think about that as part of our culture: How do we have our people recognize when we're pushing beyond the reasonable risks that you need to take developing any technology, building any business? And try and do that preemptively.

It's kind of like the Toyota manufacturing process, right? The fact that anyone along the line, if they see something that's not right, they can stop it. So we believe that you need to develop a system that has a high level of performance, a high level of reliability before you can get out there. To do that, we use a combination of different sensors, not just relying on one, but we use a proprietary LIDAR, we use radar, we use camera data that allows us to robustly see the world, and that makes the vehicle have better ability to understand what's happening than if you used any one of those modalities alone.
And then to build confidence that we ultimately can release this thing, we take an approach of building a safety case, and this is a framework by which we think about not just, how is the technology safe, but how is it being operated in a safe way on the road? And at the end of the day, that's the way that you have confidence that the public should trust this, the regulators and governments should trust it, and that we, as people who care about doing this the right way, can feel confident with it out in the world.

SAFIAN: Now, Aurora Driver is a software product. It's not a vehicle, although there’s hardware connected to it, right?

URMSON: The Aurora Driver is this integrated platform. It's a combination of the software, the hardware – which is the sensors, the compute, the networking on the vehicle that allow that software a place to run – and then the off-board data services – things like the map data product, the remote assistance – that enable the vehicle to drive itself.

And that integrated system, that mixture of software and hardware, we work with our vehicle manufacturing partners to integrate that into their vehicle. It's designed to work across different types of vehicles. Today the same hardware is on our big trucks as is on our minivans, but you can't just bolt it onto a car that you bought at the dealership.

SAFIAN: I mentioned Tesla earlier. Their approach to this is putting this technology out on the road and gathering data from that. You guys are doing some of that, but you're also gathering data through more virtual methods?

URMSON: One of the insights we had at Aurora was, A, it's not just about the quantity of data, but it's about the quality of data, and then B, that at the end of the day, just driving the vehicles on the road was not going to get you the data that you need to ultimately have conviction the thing was safe. And so we've really invested heavily in what we think is world-leading simulation capability and virtual development tools.

And so we hired some awesome folks from the computer graphics industry, from movie-making, that have come in and worked with our folks that are designing our LIDAR, the folks that are working on our perception system, and really deeply modeling the way energy moves through the world.

And so we actually modeled that in a super interesting, detailed way that allows us to have convictions that we're getting realistic models, then we can use that and procedurally generate exactly the kinds of environments that we want to go test in. And then we can do that at scale. So we can run 50,000 trucks on a moment's notice.
SAFIAN: In some ways it seems logical, you amass as many miles on the road and real-life conditions as you can, and then that tells you something. And what your philosophy is, yeah, that stuff is useful, but you can actually gather more information faster by using simulations?

URMSON: Yeah, there's three reasons why you want to gather that data. The first is to understand what happens out in the road. So how often do you encounter, I don't know, pick something, a person in a wetsuit stepping into the road, right? Does that happen once every million miles, once every billion miles, once every 10 billion? The second is to get the data that you need to train your machine-learning system, that's part of maybe your perception system, part of your motion-planning system at Aurora. And then the third would be to validate and have confidence that the thing works well enough that you can trust it on the road.

For the first of those, you can gather that data if you have a bunch of vehicles, but it's a lot more efficient if you go and tap into vehicles that are actually doing something useful in the world already. And so we do that. We go and work with partners where we're able to pull data from their fleets.

For the second one of these, where it's about gathering the data to train the ML systems, here we can target exactly what we need and be efficient about it. So we were working on merging on to and off of freeways, and so what we had is we had a truck driving around in Dallas going on and off every freeway exit. And that allowed us to get exactly the data we needed, rather than hoping that it shows up in the dataset we get.

And then finally on the third one around having conviction that the thing is safe enough, well you just practically can't get enough miles, right? In the U.S. someone dies in a traffic accident about once every 85 million miles, and so if you really want to have statistically interesting information about the post events, you're just not going to efficiently get that. Once you change the software or change the hardware in some way, then it's all invalid.

And so for us, it's, how do you decompose the problem? One of the things we've done at Aurora is we've tapped into, how does the energy industry do this? How does the defense industry do this? How does aerospace do this? Bring those ideas together, and use those types of approaches, instead of just hoping we can brute force our way to the right answer.

SAFIAN: And so, I just wanted to make sure I understand this the right way. So if I'm at Tesla and I'm pursuing this brute force approach and there's a problem that comes up, or we discover, and so then I fix it, right?

URMSON: Yeah.
SAFIAN: I don't really know that I fixed it until I'm testing it out in the world, right?

URMSON: If your argument is, we've driven a bazillion miles, the question is, what were you doing? Was it this version of software or was it some other version of software which had a bunch of changes in it? And do you really know that those changes didn't invalidate the previous miles? And so without actually having a decomposition and this safety case model, we're able to say, "Okay, we understand how this influences different parts of the safety argument," well you're going to have a hard time with that.

SAFIAN: Not all human drivers are the best at it, right?

URMSON: Yep.

SAFIAN: So what kind of a standard should an autonomous vehicle have? Is it equal to the average human? Does it have to be better than a human?

URMSON: Yeah. I think this is actually one of the really nuanced points, right? So the way we think about it is we shouldn't be creating unreasonable risk on the road. This is the standard when the Department of Transportation thinks about a new technology coming to market is that you're always trading risk. That if we really wanted the roads to be safe, we would ban cars from them. And the challenge, of course then, is that the roads are not super useful, and you can't get anywhere efficiently.

So, when we build the safety case, it's going to be, do we think we're creating unreasonable risk on the road?

SAFIAN: In a broad way, if there's any mishap on the road for any autonomous vehicle, that kind of threatens your brand and the future of this whole industry in a certain way, doesn't it? You can be careful, but if some of the other folks have things that don't work well, it makes it harder for you.

URMSON: It makes it like anything, right? This is an emerging technology, and so people don't yet understand the different parts of it. So part of what we've been doing is trying to explain to the public, to the regulators, the differences between a technology that's engineered to do the whole driving task and one that's engineered to support a human driving, right? We think that's a really important distinction. We've had those conversations with the regulators and with the government. We helped found an organization called Pave, which is out there helping provide education and trying to demystify this. There's only so much we can control, so let's focus on what we can do well. Let's trust people to be thoughtful and smart out there.
SAFIAN: So you previously worked at Waymo, at Alphabet’s self-driving unit. You helped start it up, in fact. What differentiates Aurora from Waymo, from competitors like Cruze, which GM has a stake in, Argo, which Volkswagen has backed? What makes Aurora different?

URMSON: When I think about Aurora, one of the things is just the experience our team has and the fact that we’ve brought experts together from some of these other organizations. We’re really able to synthesize those experiences into new approaches and new technology.

I think another is our approach to partnerships. From day one, we’ve had a value of focus. Do the thing that we think we can do best in the world, and that matters because we’re solving this really hard problem. It also means that we don’t want to go and build the car, and we don’t want to go build Uber or the logistics network. We want to partner with these companies that are incredibly complicated, incredibly successful, and if we can do our part of bringing the driver and somebody else can bring the vehicle and others can bring the network that uses those vehicles, then we’ll be able to run faster. I think that approach is unique, relative to what we see others doing out there.

Then we’re independent, the companies you mentioned, the Cruze and Waymo and Argo, these are all part of a mothership, and that’s powerful, because you have the synergies and connections that come from that. But it also means that you’re the other bet. You’re the other thing that’s going on, and your business model, your approach to solving the problem is going to be biased by the interests of the larger entity.

So for us, we’re leading with a product market in trucking. If you think about Cruze, well, we don’t think they’re doing that, because General Motors doesn’t make big trucks. Google is an incredible company, but they’re really a consumer-centric company. So their kind of mental focus is always going to be on kind of a consumer-facing brand that’s going to look like a ride-hailing service. So it’s just a different way to look at the ecosystem and play in it.

SAFIAN: So you mentioned that you’re focusing on coming to market first with a trucking-related product before ride-hailing. So why? Where does that decision come from?

URMSON: When we look at trucking, there are a few reasons why we think it’s exciting. One is we think we have some pretty differentiated technology that allows us to solve this problem specially. So the LIDAR technology, we’re developing in-house. Our FirstLight LIDAR allows us to see further down the road. When you think about driving a big truck at high speed, having that integrated camera, radar, LIDAR long range sensing is super important to it.

The next is really a pure business reason. Trucking is about a $700 billion industry in the U.S. Ride hailing is about a $35 billion industry. So it’s just a much bigger market to go
play in. Now, over time, we expect that ride-hailing through automated vehicles will become a much larger fraction of the personal mobility market, which is about a trillion-dollar opportunity. So for Aurora, we don’t want to miss out on that, and so the technology we’re developing will apply to both, but we lead with trucking.

Then, if you think about the value that you get to create with the technology, today the value of driving a truck is about three times that the value of driving a ride-hailing car. So when you think about building a business early on where we haven’t hit scale yet, the economics just make more sense there.

Then finally, when we think about scaling and growing the business, driving down the freeway is much more self-similar than driving in an urban environment. What I mean by that is if you think about any given mile of freeway in Texas, and then you went to a mile of freeway in Minnesota, you went to a mile of freeway in California, they all are going to pretty much look the same, and people are going to behave pretty much the same way on them.

So once you crack the problem and start it working in one of those regions, you’re going to be able to operationally build your business and expand it, whereas when you focus on ride hailing and you think about an intersection in San Francisco, and then you go five blocks anywhere from there, the streets are going to look different. The way the actors are going to behave is probably going to be different. The expectation is going to be different. So it becomes much more of a scaling technology to scale the business type problem. So we’d rather go and start building and scaling the business, start making money, and then continue to grow down and into these more varied environments.

SAFIAN: It’s fascinating as you’re talking about this, because there’s, as you say, the building of the technology, the creation of the product, and then there’s the creation of the business.

URMSON: Most startups, you have this thing, and whatever the product is, whatever the application is ... And there’s a handful of people, and they kind of make it, throw it at the thing, and they start to get a little bit of traction. And so you’re growing the product first, and then the company behind it. With Aurora, given the scale of the problem we’re trying to solve and the complexity and breadth of it, we really had to be building the company almost ahead of the product. Having never done a startup before, I guess it’s not intrinsically weird to me, but it feels counter to the stories and kind of your experience of what you see out in the world.

We could be out doing a bunch of robo taxi trials or a bunch of pilots with trucks, but you don’t have a business. So you need to get to the point where the technology turns over, you have that foundation. And then we get to do that really fun part of ... Okay, how do we tweak the business? Where do we iterate, and get into a more classical startup type model for innovation?
We think in the long-term ride hailing is going to be an even bigger business than trucking as you’re able to bring the unit economics down and tap into more and more of people wanting to get around and have the freedom and flexibility that comes with that. But today, right, there’s a real need in the freight trucking space. We are short 60,000 drivers in America, and by the end of the decade, we’re going to be short 160,000 drivers. This is the backbone of the U.S. economy.

So one of the things that's been incredibly exciting to me as I talk to carriers and shippers about this is for them, it's not about replacing drivers. It's about getting access to drivers they don't have, and having vehicles so they can grow their business so they can serve their customers better so they can be more successful. They're not looking to move on from the human drivers they get today.

SAFIAN: Before the break, we heard Aurora CEO Chris Urmson talk about crafting a self-driving business model that takes advantage of both tech and marketplace realities. Now, Chris talks about the societal implications of self-driving, and the responsibility he feels around it, especially the impact on jobs. He also talks about putting a merger together in a pandemic, the importance of urgency and why Aurora gives out a Rocket Award. Plus his perspective on what it takes to build the right team for right now.

A lot of folks, when they talk about autonomous driving, it's like, "What is the motivation? Does it really make the roads safer, does it make the economy more effective, efficient?" How do you triangulate those reasons, those rationales?

URMSON: I first got into self-driving because it seemed really cool. I was in a desert with this awesome robot that went at 30 centimeters a second, which is kind of like somebody with a walker. I had the chance to go work on a robot that drove 50 miles an hour across the desert, and that just seemed mind-blowing and exciting and energizing. But now, as I've worked in this space for, going on, I guess, 18 years, understanding what this means to people, the safety impact, right? The fact that we have approximately 40,000 Americans die every year on our roads and one and a quarter million of them globally. The vast majority of those deaths are due to human error. These are things that we can have a huge impact on.

The next is just around freedom, that most of us take for granted the fact that we can get in a car and drive it. But for six million Americans, they can't. So giving them the freedom to move around, I think, is impactful.

Then for those of us who can drive, may even enjoy driving, a lot of the time, it's a burden. Whether it's commuting on the 101 here or whether it's going out for a dinner and wanting to have a couple glasses of wine with your wife, right? This is a technology that will allow you to better enjoy life.
On the transportation side, the logistics side, the shortage of drivers is profound and limits the economy. The ability to make these vehicles incrementally safer on the road, again, is very meaningful, and the ability to kind of reduce the cost of moving things quickly through the world. So today, if you want to move goods from, say, Houston to Los Angeles, that’s basically three days. If instead you have the Aurora driver operating that truck, you’d be able to make that trip in a day. So as e-commerce continues to grow, as people demand more rapid response to their orders, this is a way to enable that without having to build a very complicated logistics network.

SAFIAN: You mentioned the shortage of drivers a couple of times. There are folks, including politicians, who express concerns that self-driving will disrupt job opportunities for a lot of people. For truck drivers, for taxi and delivery drivers, they’re often entryway jobs for new arrivals in this country. What sort of responsibility do you think as a promoter of a new technology you and your organization has for the potential negative societal impact?

URMSON: Yeah, and I think this is something you need to be thoughtful of. I don’t think it’s solely our burden to bear. I think this is a broad social challenge. I am incredibly bullish on the benefits of this technology, but this is one of the things that I worry about: the potential for job loss and displacement. And we would, in general, and probably in all cases, look back and say, “This was an important advancement for society. We live better. The world is better. There is more opportunity for all, because we have been through those changes.”

Now, that doesn’t help the people that were displaced or lost jobs in the transition. And so that’s where I think we as a community, we as a country have to be thinking about this and how do we enable them. At the same time, I think we’re going to create massive new opportunities for jobs. I look at what happened in the banking industry, where the concern was that automated tellers would mean that you just don’t have bank tellers at all, and everyone’s going to be out of a job. And it turns out that, that just changed the economics and the opportunities and the banks so that they actually created more bank teller jobs, because they were able to open more branches, they were now instead of a cost center for serving customers, they were now a value creation center.

So I think there’ll be interesting opportunities, but we have to do our part in educating and communicating and do our best to be thoughtful in introducing the technology.

SAFIAN: You did do a big deal and acquisition of Uber’s self-driving unit late last year. What was it like to put together a merger through the pandemic?

URMSON: It was hard work. I think for everyone involved, it was less personal than it would have been if we’d been able to do it with human to human contact.
I look at the acquisition we were able to make a couple of years ago of Blackmore, which is the folks that are developing our proprietary LIDAR technology. And there we were able to have more people mix and connect and have dinners together, and build the social ties that start to build trust, that build the productive work relationships. And we just haven't been able to do that to any level of depth yet with this amazing group of people we've been able to bring in.

SAFIAN: Yeah. And the Uber group was around 900 people, right? Which your existing group was smaller than that. So you were integrating a bigger operation into a smaller one, and maybe it hasn't even been fully integrated yet.

URMSON: Integrations are always hard, as you know. I think this one has gone about as well as we could have hoped, given the situation. And I think overall, we did the things that made sense. So very quickly after we announced it, within 10 days, we communicated to everyone in both companies about whether they'd be continuing on with the company. And that certainty is super important. And then within about five weeks of closing the deal, we actually had a roadmap in place for how we were going to integrate the technology from the two teams.

Now, that's gone really, really well. The thing where we're most challenged is just, again, on the relationship side and the trust that comes from working with people closely and solving problems together, and we're continuing to build that and momentum is gaining, but I think that has been a little slower than I would have liked it to have been. And something that was a missed opportunity by not being in person.

SAFIAN: Aurora is only a few years old – only four or five years old. So a lot of change in a short period of time. You and I talked a little while ago about your plans to go public via SPAC, which is expected to happen before the end of the year. How do you think that leading and being part of a public company will be another phase of different, for where you've been?

URMSON: Yeah. I think that there's a level of additional scrutiny that'll come to the company. One of our core values is to operate with integrity, and we've lived that as a private company, and we very much value our capital partners and try to be good to them as we've built the business. As we look at being a public company, I think there's just another level of communication and alignment that we need to project there so that people understand the journey we're on. Because I think we've got an incredible team, I think we are on the right path with the right plan.

SAFIAN: What's at stake in this moment for Aurora?

URMSON: I think that we've been building the company to be durable for the long term. And so I think that means that at any given moment, you can only screw it up so badly. And so when I think about it, this is really our debut to a whole new group of
people, and we get to tell our story to them, and we get to help bring them along on the journey, and I think it's an exciting journey. And so I guess the thing that's at stake is: Are we effective in helping explain the opportunity and the risks so people can make an informed decision, so they can be with us?

We're going to transform one of the biggest parts of the economy, and it's going to take time, and it's going to take an incredible amount of energy and investment upfront, but the benefit and impact that we'll have socially and economically will be profound when we get there.

SAFIAN: Yeah. There's been a lot of change, and at the same time, you need to be patient. How do you balance that patience with urgency?

URMSON: Urgency we feel absolutely. And in fact, internally, we have what we call the rocket award, which we give out at every all-hands to a team or a team member that has demonstrated moving with urgency. Because it's easy when you look at a hard, large problem to be like, "Okay, well, it's a hard, large problem. It's going to take a while to solve. So how hard do I really need to go right now?" And we think about it much more like a marathon, where you're not sprinting the whole time, but you're moving pretty hard. And it takes people who really believe in the mission and are committed to the mission, and want to see that impact in the world.

SAFIAN: Our listeners, a lot of them are entrepreneurs and entrepreneurial-minded. And as you're talking, I'm thinking, what are the lessons of your journey at this phase that you take away, that you hark back to, that maybe you're adding to?

URMSON: Yeah. There's a lot. I'd say one is it's really about the people that you surround yourself with. I don't think this is new advice, but that matters so much, and it's really hard to appreciate it until you're dealing with tough things and working through challenges. And so whatever you can do to... Whether it's your investors, whether it's your employees, whether it's whatever is part of your ecosystem, emphasizing the quality of those people over the short-term economics, I think, will pay long-term dividends.

SAFIAN: So what keeps you up at night, and what gets you to hop out of bed in the morning?

URMSON: Yeah. So what keeps me up at night is really, how can I do a better job? How can my leadership team do a better job of aligning and helping all of our employees understand what matters most. Even more importantly why it matters most, because that's how we get them to make the decisions when we're not in the room that matters.

What gets me up in the morning is, frankly, the great people I get to work with. It's a privilege to be working on the technology that I am. The fact that we're working on
something that when we’re successful will reshape the way people move, reshape transportation, I think, is an incredible privilege. But getting to work with great people who you enjoy, who share the mission, and help carry the burden of making it happen, I think, is really the reason.

SAFIAN: Well, this has been great.

URMSON: Thanks so much.