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The Boeing Co. (BA)

Investor Day

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Hey, everyone. Thanks for being here. Thank you for your time, especially those of you in the room, but also those of you online. I wanted to start this morning by just saying a couple of words about aerospace. I've been a little worried as a 36-year veteran of aerospace that we take it for granted almost now around the world. And I think the pandemic showed us how important it is to all of us.

Pre-pandemic, it connected 4.5 billion people around the world and the cultures that they live in. It brought many of you here today. In the pandemic and during the pandemic, we saw the importance of cargo delivery. We saw the importance of vaccine development and transportation around the world. We were also reminded of the importance of humanitarian relief in peacekeeping operations.

So, I think this thing that we love called aerospace, we can't take it for granted and we need to remember that it's important to people, it's important to countries and it's important to global economies. And we were reminded of that. It also is growing, so it has to be more sustainable going forward.

And I wanted to say a few words about sustainability at Boeing and Greg hit on this a little bit in his role. I'm an example of the change at Boeing. Sustainability, having a role like mine, we didn't have that two years ago. Having it report to Dave and our board, we didn't have that two years ago. It's explicitly part of the values of our company. It's explicitly part of the strategy of our company. It's critical to earning stakeholders' trust.

And I would also say, like Greg did, that we've also got a team of people. We have a dedicated leader around customer engagement in sustainable aviation fuels. We have a dedicated leader in Amsterdam with people around the world focused on sustainability policy and developments and partnering that's going on in the world. We have a dedicated Chief Engineer who focuses on future mobility and sustainability. We had none of that two years ago. We're part of that change.

We also produced our second ESG report. I know that's a topic that some of you cover. I've been fortunate and blessed to be at some of your conferences on that. So that's our way of conveying our ESG information to our stakeholders. And you know that, as you all know, is a difficult challenge. Everybody has different expectations. I can tell you our experience and judgment emphasize six focus areas in our ESG report, but the first two start with safety. I would argue safety is the foundation of sustainable aerospace.

So I just want to open with that, and then I want to put aviation in a little bit of context for you. So if we looked at aviation in context, it's about 2.6% of the world's carbon emissions. Maybe to put that in a little more context, the cooling industry, air conditioning and the like, is 4 to 5 times higher than that. The cement manufacturing industry would be about 3 times what aviation is. But we know we're growing and we know we're big and a global industry, but our global industry is actually agreed on a long-term challenge.

I would almost argue that there's not very many global sectors that you could say have the forums or the ability to even agree on a long-term goal like Net Zero 2050. And yet, through forums like IATA, with our airlines, and ICAO with our governments, we have an agreed to goal. We have an agreed to goal on how we're going to do carbon offsetting if it's required and we can't fully solve the problems by 2050.

Most industries don't have that. And then, I'm a Boeing person. I go back to 1929 when Bill Boeing said we are pioneers of a new science and a new industry. And I think when you think about what this industry has done and solved 30 years after he said that, the introduction of the Jet Age, making the world smaller with 707. About 10 years later, walking on the moon.

So we are in the era of sustainable aerospace, but this industry goes after big hard problems. This is a big hard problem. We've got to fix it. In Boeing's view on how we fix it starts with this slide. When we ask what are the focus areas, how does this industry get to net zero by 2050? What are the potential levers and ways to do it? This is what we say at Boeing.

First and foremost, it's what it's always been about, investing in fuel-efficient airplanes, new airplanes replacing older, less fuel efficient airplane. 30 to 40 years ago, it would be 50% less fuel efficient than the ones you'll get on today. And the ones that Stan and Ted talked about and are in development in the industry, when these new airplanes replace these old airplanes, we've gotten 15% to 25% more fuel efficiency. That's the challenge.

People ask how many more times can we do that in this industry? We're going to see tremendous benefits on carbon emissions when the fleet renewal occurs by what's in development today. And if you notice, most people when they make their announcements now, we don't just talk about the % fuel efficiency gains we get anymore, we talk about the tons of carbon emissions saved.

Operational efficiencies, always been important, little things that add up to big gains in carbon emissions. These are things that airlines worked relentlessly on every day to find an extra pound weight, a little less water, a little less fuel efficiency and Stephanie talked about the host of tools that our BGS services unit has to try to help people solve those problems.

But now, now, the question and all the conversation is about how will renewable energy intersect aviation and advanced technologies in flying machines? Sustainable aviation fuels, electricity, hydrogen and how those will be used in our industry and on those future platforms. It's no secret that Boeing has been a big proponent of sustainable aviation fuel. We've been involved in it since 2006. And like Greg said, things take a little time in our industry. But if you go back to 2006, our industry was asking the question, will these work? Is this even possible from an engineering or physics perspective?

One of those programs out there on ecoDemonstrator helped us say that it was. And in 2008, the first airplane flew on an ecoDemonstrator program with Virgin Atlantic on sustainable aviation fuel. So now we can fast forward and there's skepticism on how fast this can scale up. It's a hard problem. But I would also argue that we are no longer asking, is this possible, we're asking how much output can you create and by when? So that's the challenge now, moving the S-curve to the left and scaling up sustainable aviation fuel.

But we like to say it's going to take sustainable aviation fuel and whatever else can be generated, and we have to be working on the and as well. But it's going to take a lot of sustainable aviation fuel for the industry to realize its goals of net zero by 2050. And I'd tell you, I am hopeful, when you see the technology combinations, the process refinements going on, when you see what's happening in the banking industry with transitioning to a more financeable energy future, when you see what the oil and gas companies are doing to pivot to these renewable energies, when you see what's happening in the automotive industry to electrify, these big trends, I believe, give us optimism that this industry is going to solve this problem and find a way to have a lot of sustainable aviation fuel.

And there's a lot of innovation occurring in that space. We collaborate with MIT on that. And when you think about what's happening with feedstocks, renewable electricity, industrial carbon capture, the introduction of green hydrogen, these pathways are going to expand. They're going to get greener and cleaner, and it will take time. But it's a huge solution to the decarbonization of aviation. But we are working on the and.

In fact, Greg introduced a few of his people. I'd like to introduce, Brian Yutko is in the room with us today. He's our chief engineer for sustainability and future mobility. And sometimes, we like to say he's Brian and because this is the and. And if Boeing is – if there's ever any doubt that Boeing is already in electric aviation, I would just like to point back to that airplane and the 787 that's sitting behind us.

We forget there was a megawatt and a half of electrical power on that airplane. It taught us all kinds of things about electronic architectures, electric architectures, taught us a lot about voltage. Remember, it taught us a lot about batteries. It taught us a lot about thermal management on airplanes. We had a lot of learning. There's been a lot of discussion about Wisk. Wisk is one part about the urban air mobility market and will it happen and how it will happen. But it's the more important part about how electronics will get – a fully electric airplane will get certified and developed.

If you lift it up the guts of that airplane, it was designed completely differently. As Brian likes to say, it's 12 moving parts when it flies. In the lower right, you see battery packs. Those supply chains didn't exist. They don't exist. The people that are flying prototypes either buy what's available and kind of hope that it helps them satisfy their objective or you go develop those supply chains and you figure out what's really optimized to the airplane you need and the one you have to certify, because as we all know about these future technologies, nothing scales in this industry unless it's technically possible and safely certifiable, and then it has to have a value proposition and then it has to help do what you intended it to do, and in this case, that's reducing the carbon emissions of aviation by 2050. So we are in the electric business.

Now, let's talk about hydrogen. I got asked last week, is hydrogen possible in aerospace? We already use it in aerospace. We use it in rockets. We've flown it on airplanes. In the upper left, you see the first airplane to ever fly on a hydrogen fuel cell, fully electric powered airplane. Boeing did it in 2008. On the bottom, in your lower left, you see an airplane that flew on liquid hydrogen. If you wonder about its weird shape, it's because it had to be optimized for the fuel tank. L/D can be a little challenge on that airplane, right?

So we are learning. In the middle, the two pictures you see in the middle, a composite, liner-less cryogenic storage tank, made from the 787 carbon fiber system that Greg talked about, in the learning curve and the trajectory of learning's we've had on carbon fiber. That holds about the amount of hydrogen you would need to power a regional jet or a future flight concept like is in the lower right of this picture. So we're learning from hydrogen. We've used hydrogen. And when people say, well, what are the obstacles to hydrogen in your industry? I'd like to use two words, safety and infrastructure.

Safety, loading it, transporting it, refueling it, controlling temperature, controlling pressure; infrastructure and don't take our word for it, go talk to the people that are in the hydrogen production industry and there's great zeal for it. We should all want more green hydrogen in the world. It would mean there's an abundance of renewable electricity in the world. But when you talk to the people that are trying to produce it, production, pipelines, that's their part of the infrastructure. Our part of the infrastructure, airports and airplanes. And so we spend a lot of our time talking to airports about what changes they'll have to get ready for, if there were multiple ways to refuel airplanes in the future.

We spend a lot of our time thinking about airplanes like the future flight concepts and how our planes would have to be configured. But our view is, if we're serious about reducing the carbon emissions by 2050, we need a lot of fleet renewal with these more fuel efficient airplanes. We need to scale sustainable aviation fuel in this industry. And more green hydrogen could be used as a very effective ingredient in sustainable aviation fuel production to make it even cleaner and greener.

To help talk about these strategies for how the industry gets to net zero by 2050, we invented a digital tool called Cascade. It's a web-based tool. Just to orient you to the tool a little bit, in the upper left, you see some data. This happens to be a year in the life of aviation. 2019, we didn't want to pick a low year, so we went back to 2019. But you see there were 32 million-plus flights and about 952 million tons of carbon were created by the air transportation network that we call scheduled air delivery.

Across the top, we could sort that data by the type of aircraft, airlines, distances, origins, destinations. It's all aligned to the commercial market outlook that Stan talked about. Down the right, you see the things I talked about, fleet renewal, operational efficiency, the introduction of these renewable future aircraft, and yes, market based measures. And that's what – we wanted to do is to give people a way, a web-based way in real-time to have these discussions about what do you think is going to make the industry most net zero by 2050?

What are the policies that we should really be focused on if we're serious about that? And in my last chart, you can see when you run the model and start to move the levers and I hope we get a chance to interact with many of you on that, you can start to see some early results. Fleet renewal will always remain important. It's a huge component. If we could just snap our fingers and replace all the last generation airplanes with the ones we have in development and coming into the market now, you see 17% bite out of carbon emissions because of the improved fuel efficiency.

Fleet renewal is a critical component. Operational efficiency remains a critical component. Sustainable aviation fuel is a critical component. And the other thing we learned is that when we're thinking about electricity and hydrogen, we have to think about how they're produced. Are they green? Are the grids green yet? Is the hydrogen green yet? We got to solve that stuff. But this tool helps us interact with policymakers, with customers, with industry partners, and talk about what are the ways to get to net zero by 2050. And with the government, what are the enabling policies that can make the biggest difference to either de-risking or creating the flow of capital that's needed to scale this stuff up?

So I look forward to working with you. Our motto is Sustainable Aerospace Together. It's a nod to the fact that it is going to take partnerships. And I feel like these global companies like Boeing and the relationships we have around the world can bring together the people that can go solve this hard problem in the era of sustainable aerospace. S
