



The Economic Club of New York

513th Meeting
112th Year

Dennis Muilenburg
Chairman of the Board, President, and
Chief Executive Officer
The Boeing Company

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Interviewer: Frank Brosens
Trustee, Economic Club of New York
Founder, Taconic Capital

Introduction

President Barbara Van Allen

Good afternoon. Welcome to the 513th meeting of The Economic Club of New York in our 112th year. I'm Barbara Van Allen, President of The Economic Club. The Club is the nation's leading nonpartisan forum for speeches on economic, social and political issues. More than 1,000 prominent guest speakers have appeared before the Club over the last century and have established a strong tradition of excellence. I'd like to take a moment to recognize those of our – now nearly 300 – members of the Centennial Society attending today as it's through their support that the Club continues to be financial sound and able to offer our diverse programming. We'd like to also welcome members of the 2019 Class of ECNY Fellows, which is a select cohort of next-generation thought leaders sponsored by members of the Club for our year-long program. Welcome to all of you.

It's a pleasure now to introduce our special guest this afternoon, Dennis Muilenburg, Chairman of the Board, President, and CEO of The Boeing Company. With roughly 150,000 employees across the United States and more than 65 countries, Boeing is the world's largest aerospace company and top U.S. exporter. Dennis is a member of the Board of Directors of Caterpillar, Inc., the U.S.-China Business Council, the Congressional Medal of Honor Foundation, Northwestern University, and FIRST, which

stands for, For Inspiration and Recognition of Science and Technology. He's the past Chairman of the Aerospace Industries Association Board of Governors, and current Executive Committee member. Dennis is a member of the Board of Directors of the Business Roundtable and serves on the National Space Council Users Advisory Group. He also serves on the Board of Trustees for the National World War II Museum. He's an Honorary Fellow of the American Institute of Aeronautics and Astronautics, a Fellow at the Royal Aeronautical Society, and a member of the National Academy of Engineering. He holds a bachelor's degree in Aerospace Engineering and an Honorary Doctor of Science degree from Iowa State University, as well as a master's degree in Aeronautics and Astronautics from the University of Washington.

The format today will be remarks by Dennis followed by a conversation with Economic Club Trustee and Founder of Taconic Capital, Mr. Frank Brosens. Frank actually also has a degree from Princeton in mechanical and aeronautical engineering, so he has a great background for this interview. As a reminder, please, this conversation is on the record. It's being streamed live. We have a number of cameras in the back of the room. And I'd like to ask everyone to please turn off your phones if you have not already. And Dennis, it's a pleasure to invite you to the podium. (Applause)

Dennis Muilenburg, The Boeing Company

Well, good morning, good afternoon, depending on which time zone you're in. Thank you for being here today, and it's my great privilege and honor to join you. I want to thank you, Barbara, for the kind introduction. And I want to thank The Economic Club of New York for this wonderful thought leadership forum. As I said, it's a real honor and privilege to be here with you today.

I'd like to start somewhere unexpected – a farm. I grew up on a farm near Sioux Center, Iowa, which had a population of roughly 2,000 back then. That's far less than the average number of people per square mile in each borough here in New York City. My hometown is a strong community surrounded by beautiful land that people continue to work. My family had a farm there years ago and my siblings and I were the crew. We milked the cows before school, fed the hogs, watered the cattle, cared for the garden, gathered the eggs. In the fields, we'd bail hay and walk the beans. Let me translate that. That means taking the weeds out of the soybean fields, for you city dwellers. The chores we did before and after school contributed to the family business and sustained us by putting food on the table. If we skipped them, the family might not have milk to drink that day or our herds would go hungry. My parents taught me the value of hard work, respect for others, and integrity.

In a way, the farm shaped my approach to leadership and prepared me for the job I have today – leading the world’s largest aerospace company. While at different scales, both require resilience and strong core values because lives depend on what you do. My family and our animals depended on me to do my part, and now on a much larger global scale, our customers and the traveling public depend on all of us at Boeing to keep them safe.

For those who aren’t familiar with Boeing, we’re a company whose products and services impact the lives of hundreds of millions of people around the world every day. The work we do matters – to commercial airplane passengers, men and women in uniform, astronauts pushing the boundaries of space, and future generations of innovators, explorers and dreamers. And above all else, it demands the utmost integrity and excellence in how we do that work. Every day, 5.3 million passengers fly on Boeing airplanes around the globe. Ensuring safe and reliable travel is core to who we are.

It’s no secret then that this is an unprecedented time for Boeing, both in the challenges we face and in the opportunities that lie ahead. It’s only reinforced the lessons I learned years ago about the importance of our values. It’s also underscored the need for a strong company culture that we create in partnership with our people. By investing in these continually, and especially when times are good, it sustains us when the going gets tough like it is now.

This month marks the one-year anniversary of the Lion Air Flight 610 accident. It's been roughly seven months since the Ethiopian Airlines Flight 302 accident. Not a day goes by where my team and I don't think about these accidents. They weigh heavily on us and they always, always will. All of us feel the immense gravity of these events across our company, though it's nothing compared to what the friends and families of the victims are experiencing and continue to experience. This is personal for me and all of us at Boeing. Any loss of life on our airplanes is simply unacceptable. We're humbled and we're learning from these tragedies and we're taking steps to ensure that accidents like these never happen again.

At the same time, we're staying true to our values, including safety, quality, and integrity. The importance of those values has never been more apparent. It's by always living our values that I know we'll become even better and stronger as a company. A healthy company culture has been part of Boeing since its inception more than 100 years ago. Starting with our founder, Bill Boeing's desire to build something better, as he put it. It's a comment he made to his business partner after first flying in a barnstormer's float plane over Lake Washington early last century, about in the same place where I started my Boeing career some 34 years ago.

As they got to work building a better airplane, Bill started Boeing's first Safety Council in 1917, more than 100 years ago. With our values always underling our business

practices, we began formalizing them in the 1940s when then-CEO Bill Allen, developed a set of leadership principles that created a unifying approach for how our managers support their teams. In the years since, they've been a constant presence as our teams have refined them and made them their own.

Building on this strong foundation, we began steps to further strengthen our culture and values in 2015 when I had the opportunity to step into my current CEO role at Boeing. That included updating our vision for the company with our enduring values purposely at its center and launching a culture transformation effort. The work was intensive and intentional. We surveyed our people and brought in outside perspectives to determine the crucial areas we needed to strengthen culturally to achieve our ambitious goals. Through this, we began opening up a company-wide conversation on culture and making it safe to address actions and behaviors that would otherwise stymie performance. We accelerated creativity, empowered our people, and built cross-enterprise teamwork, something that we call One Boeing. This investment in culture continues today and is ever more important because we know we can always improve.

Just as we innovate in our products and services, we must also innovate in our approach to company culture. By continually breaking down organizational barriers, eliminating bureaucracy, and championing the sort of culture-driven changes that will unleash the capabilities of our team, I believe we can enhance our work in

unprecedented ways, always aligned with our values. This is true as we make steady progress on safely returning the 737 Max to service.

The investigations into the Lion Air Flight 610 and Ethiopian Airlines Flight 302 accidents are ongoing. And while the investigations have not yet issued their final reports, they have shared preliminary findings. The early information established that in both flights a software function activated in response to incorrect information from an external airplane sensor as part of a broader chain of events. This created more workload for the pilots in what was already a high workload environment.

As a result, our teams are working closely with the U.S. Federal Aviation Administration and other international regulators on software and training updates, pilot evaluations, and certification materials. As of today, our test pilots have made more than 700 737 Max flights with the new updated software. I had the privilege of personally flying on two of those test flights and had the opportunity to see firsthand the expertise and professionalism of our team. We are very confident in the work that they're doing. We're collaborating also with regulators on the process that they have laid out for certifying the 737 Max software and training updates and for safely returning the airplane to service. We are making daily steady progress on these final certification steps.

Commercial air travel is the safest transportation system in the world because our entire

industry has worked collaboratively with governments, regulators, and operators around the world to improve safety. It's this collaboration alongside technological improvements to aircraft over the decades that has created the safest transportation system globally. Since 1997, the risk of a fatal commercial aviation accident in the United States has been cut by 94% according to the Federal Aviation Administration.

Due to a culture of continuous improvement in the aviation system, a person actually has a greater chance of fatally falling down a staircase or fatally being struck by lightning than experiencing a lethal airplane accident, with over 90 million safe flights in the United States in the past ten years to prove it.

While we're working with regulators, we're also laying the groundwork for return to service by engaging with our customers to ensure they have the support they need. We sincerely regret the impact this grounding has had on our airline customers and all of their passengers. Some of our customers and their pilots have also told us they do not believe we communicated enough about this software function, and we've heard them. In partnership with global regulators, we're developing additional and enhanced training and educational materials to enable increased understanding for pilots that fly the Max going forward.

In addition, we're communicating closely with our suppliers to ensure the health of our

production system and prepare for a smooth ramp-up. Of our roughly 12,000 suppliers here in the U.S., more than 600 support the 737-production system and roughly 300 more solely support, support of the 737 fleet. Many of these companies are small and medium-sized businesses and we know they have also been affected by the 737 Max grounding.

In addition, we announced last month that the Boeing Financial Assistance Fund began operations, an important step in our efforts to help the families of accident victims. This fund will provide \$50 million in immediate financial assistance as part of a \$100 million package and pledge that we made to address family and community needs of those that are affected by these tragedies. The additional \$50 million in funds will support education and economic empowerment in impacted communities and we're developing partnerships with local governments and non-profit organizations to address these needs. Our Boeing employees are also giving and our company is matching it dollar for dollar.

Looking forward, we continue to target regulatory approval for the 737 Max return to service this quarter, though it's the FAA and other global regulators who will ultimately determine the timeline. As we continue to work through our current challenges with the 737 Max, it's critical we take a step back to humbly look at our culture as well, how we're living our enduring values and the ways we work together, especially where we

have opportunities to improve and sharpen our focus. We're taking action as a result of the accidents to reinforce our values of safety, quality, and integrity because we know we can always do better.

I'll share three important examples with you today. First, I announced this week that we're taking steps to immediately implement changes recommended by our Boeing Board of Directors that reaffirm and fortify our commitment to safety. They include setting up a new product and services safety organization that will review all aspects of product safety and strengthening our engineering function through a direct reporting line to Boeing's chief engineer.

Over the past five months, a specially appointed Board Committee rigorously explored our existing policies and processes for the design and development of our airplanes. They spoke with Boeing team members and examined our current approaches to airplane design and development. This review included external perspectives from leaders and technical experts with experience in regulated industries where safety is also paramount. These changes will strengthen engineering at our company. It will bolster the safety policies and procedures for the design, development, and production of Boeing products and services. And it will further improve Board and management oversight and accountability for safety, not only at Boeing but throughout the global aerospace industry.

Second, in addition to implementing the Board's recommendations, we're concurrently expanding our efforts to strengthen the way we manage safety across Boeing and our supply chain. We're already driving a company-wide approach to safety, quality and integrity that strengthens our vision and serves to reinforce and improve our operational performance.

For example, through broadened use of a comprehensive safety management system, we're standardizing safety policy and objectives, sharing best practices, managing risk, assessing performance, increasing visibility and accountability, and further strengthening our safety culture. An anonymous reporting system expanded across the company is encouraging our people to bring forth potential safety issues that will be reviewed by the new product and services safety organization.

Also, safety review boards have been expanded and are now led by senior company leadership resulting in enhanced visibility. Early gains and lessons learned are being applied today across a range of development and established programs. Additionally, investments in enhanced flight simulation and computing capabilities have increased our company's ability to proactively test a wide range of scenarios resulting in improved product safety. For example, over the past several weeks our software engineers have run 390,000 flight hours on the 737 Max with the new software. That's the equivalent of flying the airplane for roughly 45 years. Advanced R&D efforts in future flight decks are

also underway leveraging leading-edge work and human factors, science, and design.

And third, we're committed to reaching higher. Looking to the future, we'll continue to find areas to improve, including exploring ways we can strengthen global aviation safety in partnership with stakeholders across the aerospace community. As our industry grows and changes, the current aerospace ecosystem's infrastructure will be increasingly stressed. We see specific areas where we believe Boeing can make a difference improving safety.

One example is the need for talent that scales with the growth of the industry. We'll need to recruit and train the next generation, including a focus on pilot and maintenance technician training and building the STEM pipeline. Based on a mix of fleet growth, retirements, and attrition, we project 804,000 new civilian aviation pilots and 769,000 new maintenance technicians will be needed to fly and maintain the world's fleet over the next 20 years. As several hundred pilots and technicians reach retirement age over the next decade, educational outreach and career pathway programs will be essential to inspiring and recruiting the next generation.

We're dedicated to making a difference in this area, including through a \$3 million grant we announced in March to Embry-Riddle Aeronautical University to accelerate pilot training programs. And there will be more to come.

At this defining moment, Boeing must take an expanded leadership role with a heightened focus on safety. We're committed to always being at the forefront, proactively leading and advocating for continuous improvements in global aerospace safety. That is our mission. We'll keep learning from the recent accidents, stay true to our values, and come through this better and stronger as a company and industry. I have full confidence because I know our people and their commitment is relentless.

Overall, we see a need for more than 44,000 new commercial airplanes globally over the next two decades, doubling the fleet size. Worldwide air travel continues to grow at a historically brisk pace. Year over year passenger travel growth for the past five years has averaged 6.2% driven by low airfares, higher living standards, and a growing middle class in large emerging markets. And the growth of tourism and travel relative to total consumer spending in major economies has also been a driver.

Roughly 6 to 10% of the world's population flies annually, only 6 to 10%. By many reports, we estimate that less than 20% of the world's population has ever taken a single flight. So, think about what that means for the future. This means the world is going to need many more airplanes to fill that inevitable demand. To meet these needs, our projections show that the global fleet will double in size over the next 20 years. We'll meet this demand with an unceasing focus on our values and a commitment to ongoing improvement.

When I moved from working on the farm to working at Boeing more than three decades ago, starting as an engineering intern, our amazing people inspired me and they continue to inspire me today. I see their commitment to living our values, delivering with excellence for our customers, and always, always raising the bar when it comes to safety, quality, and integrity. Together, we're humbled and learning. We're resilient and resolute. We'll never waiver in our commitment to excellence because the importance of our work demands it. Nothing is more important to us than the safety of our customers and the flying public. Centered on our values of safety, quality and integrity, we'll work together to design, build, and support the safest airplanes in the sky. This is where we'll see the best of Boeing and our aerospace partners as we work to come through this stronger as a company and as an industry. Thank you again to the Club for the opportunity to be here today, and I look forward to your questions. Thank you.

(Applause)

President Barbara Van Allen: Thank you Dennis. I'd like now to have Frank come up and join Dennis for the conversation. Thank you.

Conversation with Dennis Muilenburg, The Boeing Company

FRANK BROSENS: Thank you Barbara and thank you Dennis for coming in at a time that is obviously challenging for the company.

DENNIS MUILENBURG: Thank you.

FRANK BROSENS: Boeing, as Dennis mentioned, goes all the way back to 1916. Today it's the largest producer of commercial aircraft in the world and the second biggest U.S. defense contractor. In 2018, it was named as one of the top 20 most admired companies in the world. Dennis, 2019 has obviously been a lot more challenging for the company. You talked a little bit about value-based leadership. Talk a little bit more about how you and the board approached it with that in mind.

DENNIS MUILENBURG: Well, Frank, you're right. It's been a challenging year for us without a doubt. And, as I said earlier, we've learned a lot through this experience. We've been humbled as a company, but it's also given us perspective on what we need to do going forward. And, you know, thankfully, accidents like this don't happen very often, but when they do throughout history, they are points of learning and points of change. And so this has been a real defining moment for our company. What it's done is it's reconfirmed for us the importance of the values that I talked about and it's a really strong reminder that lives literally depend on what we do. And I think many businesses can say that but the reality of that in Boeing is so real and it's in the DNA of our people and who we are. And so recognizing that lives depend on what we do, the excellence that that demands, it really reinforces those values around safety, quality and integrity.

So a lot of the board discussions we've had have been around that and talking about what can we learn, be humble, and learn what we can, but also be confident about the future because of the amazing team we have and our commitment to our values.

FRANK BROSENS: A lot of other companies have also faced incredible challenges. Maybe not to that extent. Did you look at the way other companies dealt with it? And what did you learn from that, if anything?

DENNIS MUILENBURG: Well, we did. And, you know, we – both internally and externally – sought voices of expertise. And we've looked at the accidents, we've looked at every dimension of what occurred. We've been working with regulators and other stakeholders. We've looked at how other companies have handled other crises and crisis management. And all of that really comes back in the end to leadership and how we have to stay true to our values in the midst of the crisis. And I think in this case it's a fairly obvious lesson learned, but one that becomes really poignant when you're faced with a situation we're in. And that consistency of values, no matter how hard it gets, no matter how many external criticisms we might take, we need to stay true to those values.

FRANK BROSENS: Boeing recently identified themselves and reported to the FAA early cracks in what they call a pickle fork, which as I understand it is a component that

connects the body of the airplane to the wing structure. Separately you've said that when the Boeing, the 737 Max is re-certified, you expect it to be amongst the safest airplanes ever to fly. What gives you that confidence?

DENNIS MUILENBURG: Well, one the first point you mentioned. This is an item that came up on the 737 NG fleet, not the Max fleet, earlier this week. And I think what it represents again is this continuous improvement cycle that I've talked about in aviation. So we are around-the-clock, around the world every day working with our customers on fleet support. And we discovered, some of our team members discovered some cracking on some airplanes that were in for modification and so they immediately reported that. And subsequent to that, the regulators are taking actions on inspections. And this is that continuous improvement cycle that makes sure airplanes stay safe. We're always paying attention to fleet improvements. So I think that's part of the culture that's important. That culture applies to the Max as well. So when we say it's going to be one of the safest airplanes ever to fly, it's because of my confidence in that culture. I can also tell you that we have looked deeply at the Max and its design and the processes over the last year. And the software update, we have extraordinary confidence in. As I said, we've flown 700 test flights with that software, dozens and dozens of simulations with customers. But in addition to the updates to the airplane which add redundancy to make it even safer, we're also working on updated training packages for pilots and maintainers. So it's a holistic solution that will give us all

confidence that this airplane will be one of the safest ever to fly.

FRANK BROSENS: The reports in the news recently, you talked about airplane design in terms of the relationship between the pilot and the cockpit. Why is that important?

DENNIS MUILENBURG: Yes, one of the key parameters when we design commercial airplanes, what we call the flight deck and the human machine interface, so how is data presented to the pilot? What are the controls laid out? How do the pilot and the co-pilot work together? How do they communicate with the ground? All of the parameters that affect the information that the pilots have to deal with on a daily basis. You know pilots are highly, highly skilled individuals and they have to deal with lots of information. So effective presentation of that information is really important. And as we look to the future, we know that pilot demographics are changing. We know that the experience base is rapidly expanding. And a lot of that fleet growth that I talked about earlier, the doubling of the fleet size, is happening in parts of the world that don't have a long history of pilot development like we have in the U.S. and Europe. So, as we think about new pilot demographics, we think about new machines, new technologies, we're always trying to keep our flight deck interface on the leading edge of design to make the airplanes as intuitive as possible to fly. And that's where we're concentrating some of our efforts.

FRANK BROSENS: I mean that obviously raises a question. I mean that kind of growth puts enormous demand on finding new pilots and also making sure that they're properly trained. You know, what role do you play in making sure that you have the right training for those pilots?

DENNIS MUILENBURG: We believe we have a very important role. Obviously, it's a shared role with many other stakeholders, including the regulators, our airline customers, educational institutions. As I mentioned in my comments, we see a world that will need about one and a half million new pilots and maintenance technicians, aviation maintenance technicians over the next 20 years. That's a big increase in the population. And attracting students to those kinds of career fields is part of the answer. The training that goes with that, the curriculum is something that we jointly develop with our customers. Using new simulation techniques to assist with the training is another part of what we do. So we have a very important role in developing that future skill set. And just more broadly, attracting students and kids to STEM career fields that can then turn into pilots and other aerospace experts, it's a big challenge for us as a company and more broadly as an industry.

FRANK BROSENS: The challenge is obviously, as you pointed out, not just on finding new pilots but on the maintenance side as well. You've talked about bringing some of that servicing in-house. Does that address some of those issues?

DENNIS MUILENBURG: Well, it's one of the objectives behind that. As you know, a couple of years ago we built and launched a new Boeing Global Services business. So, in addition to our commercial airplane business, our defense and space business, we now have a services business. And its objective is to create world-class service and support for our customers around the world. So everything we do in that business is looked at through a customer value lens. And in some cases, to build that business we're rebuilding some of what I'll call vertical capabilities inside of Boeing, which gets to things like training and software and avionics – areas where our deep knowledge of the airplane can also benefit our customers and as a result also help us grow our business. So we see a synergy there behind growing our services business – better support, better value for our customers – and leveraging some of the new technologies in the software and simulation areas in particular.

FRANK BROSENS: You mentioned kind of the relationship with the regulators in general and kind of the, I think you said 94% risk reduction just over the last couple of decades. Obviously, working with the regulators is critical. Talk a little bit about the relationship over the last year with the regulators, with the international regulators, and also whether as a result of these incidents, you think it changes over time?

DENNIS MUILENBURG: Well, first of all, that regulator responsibility and relationship is

very important to us. It always has been. And it's very important that we have deep, insightful relationships with the regulators so that they can understand the technology in our airplanes, have a deep understanding of the certification processes, but at the same time maintain their appropriate independence and certification authority. And that's something that we ensure happens on a daily basis. But as part of this last year, again, we, along with the regulators, are taking a look at the end-to-end certification processes and how is that work done? And not only in the FAA, but as you pointed out, international regulators. We have more than 30 global regulatory bodies that are part of this Max solution alone. And so each of those constituencies has questions, you know things that they raise as part of their normal process. And so our job is to help work across all of those regulatory bodies. And then there's a lot of external review boards that are going on as well, you know, looking at the regulators in terms of the end-to-end certification processes. And whatever we learn from those reviews, I'm confident the FAA and others, will take those on. And certainly any of those that affect our Boeing business we will take those on.

FRANK BROSENS: Is there going to be a difference in the way that they interact, the regulators themselves?

DENNIS MUILENBURG: I think we'll likely see some modifications. We're going to see, you know, additional in-depth analysis of our certification processes, things like software

development. You know the nature of airplane design is changing with time. So I talked earlier about flight decks of the future. Airplanes are becoming more software-intensive, more digitally-intensive in the future. And so regulatory and certification processes will also evolve to keep pace with the technology.

FRANK BROSENS: I understand you're still building somewhere, 40 to 45 planes a month...

DENNIS MUILENBURG: Forty-two a month.

FRANK BROSENS: Forty-two a month, while you're waiting for re-certification. Where do you put them?

DENNIS MUILENBURG: Well, so, you know, this is part of the challenge we have because as we obviously went through the Max grounding, which we fully supported the rationale for doing that, we also had to take a look at our production system and ensuring health of that production system while the Max was grounded. So, on the day of the grounding we had some 380 aircraft that were grounded in place, already delivered to our customers. We dialed back our production rate from 52 a month to 42 a month. We found that was a level that could be sustained within our supply chain, but it did mean we had to find storage locations for those airplanes. So we've been building

and storing airplanes. We have a couple of locations in Puget Sound and then set up additional bases in Moses Lake, Washington and San Antonio where we have the capacity to store those airplanes. And each one of those airplanes is being cared for individually so that once the grounding is lifted, tail number by tail number, we'll be ready to bring those airplanes back up.

FRANK BROSENS: You've mentioned fixes to the airplane. I think you touched on the software fixes. Tell us a little bit more about the software fixes and how it addresses the issues.

DENNIS MUILENBURG: Well, the principle thing we looked at in the software is there's a software function that I mentioned in my comments that many of you have seen in the press. It's called MCAS. It's a Maneuvering Characteristics Augmentation System. But it's a piece of software that enhances the feel of the airplane in the pilot's hands, and that software was erroneously activated by bad data coming into the airplane. So the software update we've made adds triple redundancies to that software. One, it requires two sensor feeds instead of a single. Secondly, it can only operate once instead of multiple times during a flight. And thirdly, we've reduced its control power. And so with those three redundancies built in, as I said, we've flown that new software more than 700 times. I've personally flown with it a couple of times. We are very confident in that software solution. And we are now just marching through the final steps on certifying

that so that everybody is confident in the safety of the airplane.

FRANK BROSENS: When you say reducing the control power, you mean allowing the pilot to effectively override it more easily.

DENNIS MUILENBURG: You got it, yes, reducing the amount of influence that it can have on the airplane.

FRANK BROSENS: You've set up a number of committees, internally, obviously the board is very involved. The regulators are involved. How does the whole process interact? How do the committees interact with the regulators? Do they?

DENNIS MUILENBURG: Yes, so the board committee that I asked our board to set up back in April was headed by Ed Giambastiani. He did a fantastic job over the last five months, really examining every aspect of our processes, internally and externally, a lot of external voices, expertise from other industries, expertise from regulators or retired regulators. So we've considered every potential input into that committee. The recommendations and the actions that I rolled out on Monday of this week speak specifically to robustly implementing all of those actions. It includes a new safety review board structure, a safety organization within Boeing as I mentioned, new processes to ensure that safety issues that employees might bring up or anybody in our supply chain

might bring up get the right visibility. And so all of those mechanisms will ultimately interface with our regulatory bodies. That will be part of our safety process. With the FAA, we have something that's called the Continued Operation Safety Program. This is the continuous improvement program that every day around the clock, around the entire world, the more than 12,000 Boeing airplanes that are out there, we are continuously assessing and improving the safety of those airplanes. And the actions that we're taking here this week will only add to that and all of that is done in partnership with the regulators.

FRANK BROSENS: I appreciate you're addressing all the 737 issues. I'd like to switch briefly and talk about the economy, which might be of some interest to a few people out here. You've got a unique position on the relationship between the U.S. and China. Tell us a little bit about how you see it evolving, you know, the trade skirmish or whatever we want to call it.

DENNIS MUILENBURG: Let me, maybe just a little bit of context on that, so of the airplanes that we deliver and the 44,000 new airplanes the world is going to need over the next 20 years, about 80% of those are outside of the U.S. and Europe, which had been traditional aerospace markets in previous decades. So the marketplace of the future is much more global. The single biggest airplane market outside of the U.S. is China. And of those 44,000 new airplanes, about 7,700 will be in China. So a productive

trade relationship is important to us. It's also important to the U.S. economy. Those airplanes that we sell to China, about one out of every four airplanes that comes off our production line goes to China. Those are built in the U.S. About 90% of our manufacturing jobs are in the U.S. So there's a strong reason for the U.S. to want a healthy trade relationship when it comes to aerospace because of the trade surplus it generates here in the U.S. In talk of trade deficits these days, aerospace is the biggest trade surplus generator, to the tune of about \$90 billion a year. And Boeing and our business is by far the biggest piece of that. So, there is motivation for economic benefit in manufacturing prowess here in the U.S. On the China side, they need the lift, they need the airplane capacity because it's an enabler for the rest of their economy. So we do see mutual interest in a health aerospace ecosystem in both countries. I think in terms of the trade discussions, there are some hard issues that need to be addressed, things around intellectual property, business structure. And it's important that those be addressed. But we also think it's important that the sub-text there includes a health trade relationship and recognizes the mutual benefit of the aerospace sector. And so we're hopeful those will converge ultimately in a trade deal that's beneficial to both.

FRANK BROSENS: You're hopeful. Are you optimistic?

DENNIS MUILENBURG: I would characterize it as wait and see. We have a voice at the table. We're very engaged, both in the U.S. and China. It's a challenging situation right

now. I think ultimately both countries will come to a deal. I think the timing of that deal is very uncertain and your prediction would be as good as mine. But I do think it's important that we ultimately come to deal that's beneficial to global trade.

FRANK BROSENS: And right now, as you point out, a huge customer, they also in the future might be a huge competitor. You know Comac is, how do you see that competition developing and what does it mean for you?

DENNIS MUILENBURG: Well, they will definitely be a competitor for the future. Now, Comac, you can think of them as, you know, perhaps the Boeing or the Airbus of China, developing their first airplane. They're also in our supply chain. Comac builds components on all of our commercial airplanes today. So, they're an important part of our supply chain around the world. And that's the way, you know, our business works. We have competitors and collaborators and suppliers all intermixed in our networks. And when we look to the future, we do expect China to be a competitor. We expect them to be part of our supply chain. And our only way to win in that kind of environment is to continue to out-innovate. Right? We can never stand still. And we have a technological lead, an innovation lead. Our company has won for more than 100 years because we've out-innovated the competition. So we can't stand still. You can't win in the future by playing defense. We have to out-innovate the competition. And that's why you see us continuing to invest as a company knowing we're going to have future

competitors around the world. Aerospace is an extraordinarily attractive marketplace – an \$8.7 trillion market – growing faster than GDP. Arguably, the strongest industrial market worldwide. So we should expect competition. We like competition. It makes us better. We just have to keep out-innovating.

FRANK BROSENS: What does the innovation look like over the next three to five years?

DENNIS MUILENBURG: Well, we have a lot of innovation going into the marketplace today. I'd say we're bringing more innovation to the market now than we ever have. I talked about the 737 Max earlier and obviously a challenge there, but it is a great innovation, a game changer for our customers. The new 777X should be the largest two-engine, wide-body airplane ever to hit the market. It goes into flight tests next year. That will give you the opportunity to connect any two city pairs in the world in a single flight, dramatic network improvements for our customers. And we're bringing new innovations to the defense marketplace. Our new T-X Trainer for the U.S. Air Force, just renamed the T-7 Red Hawk. We're bringing autonomous capabilities to our military customers, new space innovations. And we're also innovating and changing how we design and build new digital systems, autonomous systems, putting robotics into our factories and designing those so that we can have humans and robots working together as we assemble airplanes. So a tremendous amount of innovation going, not only into

our products and services, but also into how we do our business.

FRANK BROSENS: The MQ-25 Stingray, I guess, had their first launch last month, which is the, I guess it's an autonomous refueling...

DENNIS MUILENBURG: Yes, for the U.S. Navy.

FRANK BROSENS: For the U.S. Navy.

DENNIS MUILENBURG: Yes, so it's a program that we won recently and we just had the first flight a couple of weeks ago. MQ-25, it's an autonomous refueling airplane. So it has the ability, again with the U.S. Navy, it will launch off of aircraft carriers. It'll set up a refueling station at the desired location. Other aircraft coming off the aircraft carrier, fighters like the great Super Hornets, will be able to do in-the-sky refueling with this autonomous refueler. And when the mission is done, it has the ability to come back to the aircraft carrier and do what we call a trapped landing on the aircraft carrier. So a tremendous advancement in autonomy, but also bringing tremendous value to our U.S. Navy customer.

FRANK BROSENS: Round-trip flights.

DENNIS MUILENBURG: You got it. It's the only kind of trips we do.

FRANK BROSENS: As the CEO of Boeing and also as a member of the Business Roundtable, you've also got a front row seat on the U.S. economy and also on the world economy. How do you see the outlook there?

DENNIS MUILENBURG: Well, I think we all see the challenges that are out there today but, you know, my view is more bullish than I think some sectors. We do see aerospace as an incredibly strong sector. And as I mentioned earlier, \$8.7 trillion marketplace over the next ten years. Passenger growth around the world is really fueling that. We see passenger growth continuing to outstrip GDP in every regional market that we look at. It's not, passenger traffic these days is not nearly as much driven by the economy as it was previously, as it used to be in the U.S.-European dominated traffic. Today, it's really being driven by a middle class that's becoming able to fly for the first time in their life. That stat I mentioned earlier is quite staggering that we have less than 20% of the world's population that has ever taken a flight. Every year we're seeing about 150 million first-time passengers in Asia. And once they fly, they want to fly again. So, that's why perhaps my outlook is a little more bullish than some sectors. Certainly, some of the trade challenges, economic challenges we have right now weigh on us and there have been some mitigating factors, but our long-term view is strong.

FRANK BROSENS: Long-term view on the economy or long-term view on demand for airplanes?

DENNIS MUILENBURG: The economy and the aerospace sector.

FRANK BROSENS: It sounds like the aerospace sector is going to do well regardless near-term challenges in the economy.

DENNIS MUILENBURG: But we also, you know, fuel the broader economy. As I said, big manufacturing job generator here in the U.S. We're the biggest exporter in the U.S. So we fuel the rest of the economy in many cases.

FRANK BROSENS: With respect to exports, you've talked some about the importance of the EXIM Bank. Why? What do they do?

DENNIS MUILENBURG: Well, the EXIM Bank is incredibly important. Think of it as a credit facility of last resort for international customers that want to buy U.S. products. And that structure is one that the rest of the world employs – more than 60 similar banks around the world. And what it does is it facilitates customers that want to buy U.S. products. And I think sometimes the EXIM is characterized as something that's fueling Boeing or our supply chain. Well, what it is, it's a credit facility for people who want to

buy airplanes. And when they buy those airplanes, those are built here in the U.S. So the connection between a strong EXIM and manufacturing jobs in the U.S. could not be more clear. And so that's why we've been very strong advocates of that. We're encouraged by the fact that EXIM re-authorization has been extended as part of the ongoing budget CR, but we're really advocating for a long-term extension of EXIM. It's about U.S. competitiveness and it's about manufacturing jobs here in the U.S.

FRANK BROSENS: We touched on the MQ-25 Stingray. That's only one of a number of autonomous vehicles you're producing as I understand it. What's the future of autonomous flying, in both defense and also commercial?

DENNIS MUILENBURG: Well, we're going to see more and more applications of that. Certainly our defense and military customers have been on the leading edge and there's a host of different applications in their missions. In many cases, some of the toughest, most dangerous missions that autonomous vehicles can effectively do in connection with piloted vehicles separately, it's a great way to protect our servicemen and women around the world. I think our defense customers see that and so they're leveraging the technology. I think that will continue to expand. Autonomous space vehicles, we have the X-37, which sometimes you see it reported in the news as an autonomous space vehicle that we've been testing with the U.S. Air Force setting some endurance records in space. And ultimately, we'll see autonomous vehicle application in

the commercial world. I think you'll see it first with freight delivery. You've seen many players who now are looking at drone delivery of packages. That's an initial step. You'll see that grow with time. We could see things like freight delivery in autonomous vehicles. It could happen in the near term. So that's an area that I think will continue to grow. It's really important, though, as we do that, that we understand it from a certification standpoint and a safety standpoint. And so my biggest focus there on autonomous systems is making sure that they can operate safely.

FRANK BROSENS: Autonomous commercial flights in our lifetime?

DENNIS MUILENBURG: I think you're going to see more and more autonomy coming into the marketplace. Those decisions will ultimately be made by customers. Public acceptance, right? Will passengers accept un-piloted vehicles or not? We do see some initial applications in this idea of flying taxis, so one or two-person taxis in dense urban areas. We have prototypes that we're flying today as do several other companies. I would not be surprised to see revenue-bearing operations in those kinds of autonomous vehicles within five years. More expansive application, I think, is a bigger regulatory hurdle. It's a bigger public acceptance hurdle. And really important again that as we grow, it has to be safe.

FRANK BROSENS: Commercial flights to Mars, the beginning of a new space race?

DENNIS MUILENBURG: Well, there is more energy and funding going into the space business today than in decades. And I don't know that the whole country has realized all that's going on yet, but it is an incredible marketplace right now, really driving innovation. It's one of the biggest things we do for attracting STEM talent as well. Just to give you two examples, we're building and getting ready to launch what we call the CST-100 Starliner. That'll be a vehicle that will operate in low-Earth orbit. Low-Earth orbit is about from the surface of the Earth to 300 miles up. The first launch of that vehicle is later this year. We expect ultimately that will grow into a commercial low-Earth orbit business. But to Mars, we're also working with NASA on the first rocket to Mars, a space launch system. It's called the Artemis mission, sister of Apollo. And we are building that first rocket now. It's in rocket stack. We'll have the first test flight next year. And I firmly believe that the first human that steps on Mars will get there on that rocket and we're building it today with NASA.

FRANK BROSENS: When does that happen?

DENNIS MUILENBURG: The first Mars mission will probably be in the 2030-time frame. It'll be dependent, I'll say, more on stable funding. The technology is coming together well, but these long-term space programs are highly dependent on stable funding. It requires endurance to get to Mars.

FRANK BROSENS: Can I reserve a seat on that flight?

DENNIS MUILENBURG: I'll save one for you right next to me.

FRANK BROSENS: You know 50 years ago, the efforts to fly to the moon drove a huge technological boon. We're seeing technology today increase at just breakneck speed. You're kind of at the cutting edge for the aerospace industry of advancements in technology. If there were one or two technologies that would blow our minds, what would they be?

DENNIS MUILENBURG: Well, as you said, there's a great intersection. So, in some cases we're driving the technology. In some cases, we're taking it from other sectors like the tech sector. But these are all converging in next generation transportation capabilities. So, let me just give you a really quick version of this low-Earth orbit space ecosystem that we believe will become real over the next decade. Today, we have one destination in space. It's the International Space Station. Many companies are working on space hotels for tourism, space factories where you can leverage low gravity, zero gravity manufacturing, additive manufacturing, 3D printing. That intersection with doing it in a micro-gravity location opens up all kinds of possibilities. So, space-based manufacturing will be another destination. Once we get to about 10 to 12 destinations,

you'll need a highly capable commercial travel system to get there. It's our Starliner. And I wouldn't be surprised that over the next decade you see a viable low-Earth orbit space ecosystem coming to fruition. And at some point, it will be as common for all of you to take a space flight as it might be for you to fly on an airplane today.

FRANK BROSENS: And stay in a space hotel somewhere in orbit.

DENNIS MUILENBURG: Could be.

FRANK BROSENS: Okay. I guess I'd like to finish, you know, you have a pretty unique career history. You mentioned starting on a farm. I think you started as an intern before even...

DENNIS MUILENBURG: Engineering intern, yes.

FRANK BROSENS: Even before completing college. As CEO today, do you wander around the halls and look at the interns and see if you think that you might see the next Dennis Muilenburg?

DENNIS MUILENBURG: Well, certainly we have incredibly talent. We bring in about 2,000 interns a year, so a big crop of talent. And I can tell you when I came to Boeing as

an intern, I wasn't planning on being the CEO, right? It wasn't my objective. And I'm deeply humbled and honored to have this position. But what it's reminded me of is over my career of 34 years at Boeing, people invested in me. They gave me an opportunity to be an intern at Boeing. I had managers along the way who gave me challenging assignments, took a chance on me, stretched me, grew me. And it reminds me of the importance of me doing that for our people, right, and every step of the way investing in the people around us. I think it ties back to the values I talked about earlier, who we are as a company. There's no greater investment that we make than the investment we make in our people. And that's where the values of the organization come into play – safety, quality, integrity. Investing in our people is the most important thing we can do as leaders.

FRANK BROSENS: Dennis, thank you. This was terrific. (Applause)

PRESIDENT BARBARA VAN ALLEN: Thank you Dennis.

FRANK BROSENS: So commercial flights to Mars and space-based hotels.

PRESIDENT BARBARA VAN ALLEN: Yes, it's an exciting future that we have, right?

Thank you, Dennis. It was our pleasure to host you here at the Club. And thank you, Frank, for all the prep that you clearly did in advance of this interview. As you can

imagine, Dennis has a lot packed into his schedule here for his trip to New York, so I know you've got to move on to your next commitment. You won't be able to stay for lunch. But thank you again for being here with us.

DENNIS MUILENBURG: Thank you Barbara. I appreciate it. Thank you. (Applause)

PRESIDENT BARBARA VAN ALLEN: I want to mention that we have the head of Santander Bank on their way to speak to the Club, Ripple, the CEO there, Bob Iger with Walt Disney is coming up, Elena Botelho, a partner with ghSMART will be speaking, David Cordani with Cigna. We have the CEO of Uber coming. We have the CEO of BlackRock all for you between now and the end of this year. So stay tuned. Thank you. Enjoy your lunch.