U.S. SENATE COMMITTEE ON
COMMERCE, SCIENCE & TRANSPORTATION
Senator Maria Cantwell, Chair

U.S. Senator Maria Cantwell

Senate Committee on Commerce, Science, and Transportation
Hearing: Advancing Next Generation Aviation Technologies

March 29, 2023

Opening Statement

VIDEO

We are having a hearing this morning on advancing the next generation of aviation technologies. Before I start with my statement, I just want to make a point to again thank the Chair of the Subcommittee for all her hard work and chairing these series of hearings that we're having. And obviously, my colleague the Ranking Member, for our discussions. It's our hope that during the recess members will submit their ideas about things they would like included in an FAA reauthorization bill. We may not be done with all of our work, but we certainly want to use this period during the recess to surface the ideas that people want to see included and continue that discussion.

This morning, the hearing is focused on the United States' leadership in sustainable aviation technologies and innovation that will define the next chapter, generation, of commercial airplanes. And I believe, critical export opportunities for the United States.

This is about winning a competitive race for the future.

And to meet these new challenges, we must enhance research partnerships, expertise between the FAA and NASA, and FAA standards on certification of novel aviation technologies.

We will hear from Associate Administrator Bob Pearce about NASA's work to make this a reality.

Today's research will get Americans moving faster. And I'm excited that – this year – NASA will conduct the first flight of its new low-boom supersonic aircraft.

Moving America one step closer to supersonic air travel is what the Commerce Committee envisioned when they authorized this program to begin with.

NASA's Sustainable Flight Demonstrator project will disrupt traditional airframe technologies through novel wing designs and shape the next generation single-aisle airliner. This has real-

world commercial outcomes for America's competitiveness: single aisle aircraft are projected to represent 70% of the global airline fleet by [2041].

Sustainable aviation is good for the bottom line, enabling airlines to save money in operating costs and maximize fuel efficiencies.

The FAA Continuous Low Energy, Emissions, and Noise (CLEEN) program will save 36 billion gallons of fuel by 2050, with savings about $90 billion dollars for airlines. These emission cuts are equal to removing 3 million cars from the road between 2020 and 2050.

We should triple funding, in my opinion, for CLEEN and its next phase of focusing on zero-emission aircraft innovation.

Start-ups and local government should have access to Federal technology investments. Yesterday, Snohomish County in my state, along with the Washington State University, announced plans for an Applied Research and Development Center to produce and store sustainable aviation fuel.

U.S.-based projects like these are why it was important in the Inflation Reduction Act to secure funding for developing low-emission aviation technologies, known as FAST-TECH, and build the infrastructure needed to scale up sustainable aviation fuel, SAF, and I'm glad to see that program is getting launched this year. FAA's Kevin Welsh will tell us how we can expand its impact in this reauthorization bill.

Since the beginning of the CLEEN program, GE has partnered with the FAA to introduce technologies like LEAP, a family of engines powering today's narrow-body airplanes. Three out of the four aircraft departures today across the globe are powered by these engines built by GE and its joint venture. So I am glad they are here today to talk about that.

This kind of success does not go unnoticed in the information age. And we must work harder to keep America's competitive edge.

We will hear from Arjan Hegeman about GE's work to develop more efficient open-fan engines. And one day, these propulsion systems will power commercial airline flights around the world.

The FAA authorization bill, I believe, can bolster research and development in innovation technologies. But there's also a lot going on in the private sector.

Earlier this month, at the AeroTEC Flight Test Center in Moses Lake, Washington, Universal Hydrogen flew a regional airliner – an 84-foot Dash 8 aircraft – equipped with engines powered by hydrogen fuel cells. This was the largest aircraft ever to fly principally on hydrogen power.

In January, ZeroAvia, with a growing presence in Everett, Washington, flew what was at the time the world's largest retrofitted commercial hydrogen-electric aircraft to date.

So I welcome both Jon Gordon from Universal Hydrogen and Val Miftakhov from ZeroAvia.

And I'm proud that these companies, along with Eviation and magniX that are in Washington State, are continuing to build the next generation of aviation technology.

These technologies can provide new access to thousands of local municipal airports on lower fuel costs and maintenance costs, that's why we want to see this develop.

So congratulations to both of you for bringing these new products to us and the future one step closer.

Achieving net-zero aviation emissions by 2050, a target shared by industry and the Federal government, will require shifts in commercial aircraft development and different fuel sources.

So this means building aircraft made from lighter weight thermoplastics and composites that are so important and we want to continue to see leadership on that issue, particularly in the State of Washington.

We feel like we must seize on the opportunity with this FAA reauthorization to strengthen America's competitiveness in aerospace. I look forward to hearing from all the witnesses and helping us meet this challenge.

Q&A Portion

VIDEO

Senator Cantwell: Thank you, Chair Duckworth, thank you so much again for chairing this important hearing and for all our witnesses in describing the advancements in aviation that may not be all here, some are here, but what we need to continue to work on for U.S. competitiveness.

Mr. Pearce, I'd like to start with you. I'm very interested in the Hi-Rate Composite Aircraft Manufacturing program, Hi-CAM. This is something that I certainly believe we need to do, there are multiple companies like Boeing and Mukilteo-based tooling company, ElectroImpact, [that] are involved in Hi-CAM.

Obviously, the CHIPS and Science bill said, let's continue to make sure that we're on the cutting edge of aerospace manufacturing and scaling up on the certification process. NASA has clearly recognized how important this is to invest in composite manufacturing.

What do you see as the latest, well, the largest impediments for us moving forward? What else do you think we need to do to really be successful here in the next phase of manufacturing?

Robert Pearce: The challenges that we're going after, with respect to Hi-CAM, is really the ability to produce composite aircraft structures at [a higher] rate. Today, it is state of the art in terms of aircraft production, especially if you look at the Boeing 787, the Airbus A350, they are composite aircraft, but they can only be produced economically at relatively low rates.

Senator Cantwell: So you're saying 10 to 14 a month?

Robert Pearce: Right. And you know, if you want to do that for a single-aisle aircraft, you'd have to get that up to 60, 70, 80 aircraft a month. And the way current composites are produced, [it] doesn't allow you to do that economically. You'd have to essentially create lots of parallel lines, which really would just not be affordable.

So what we're doing is looking at the composite material systems and the ability to produce those at much faster rates. And so we've got - in fact, today, just a little while ago, through our Advanced Composites Consortium, which has been together now for probably close to 10 years now. That brings together the U.S. composite manufacturing industry.

We've just let several contracts, about 30 contracts, to look at the fundamentals of the different material systems and what it would take to speed those up. And then based on the results of those studies, we'll take the highest leverage components of that and then take those to higher scale, so that we actually get to demonstrate at near full scale the ability to produce these composite aircraft at higher rates. So that's the focus we have.

Senator Cantwell: Are we falling behind here?

Robert Pearce: Well, I'd like to think that, you know, through our previous effort, the Advanced Composites project, which demonstrated that we can speed up the rate at which we develop and certify these aircraft and now with what we're doing to speed up the manufacturer that we will stay at the leading edge of composite aircraft development and manufacturing.

But if we don't do these things, yes, we will fall behind.

Senator Cantwell: Well, I think, obviously, for people who may not know, composites are lighter weight materials that drive down on the fuel costs. That's clear.

But I have a lot of aerospace machinists in my state. I'm pretty sure Senator Cruz has a lot of aerospace machinists. They want to be on the cutting edge of technology. They want to be driving [innovation].

I know that there is a thermoplastics center, I think it's in the Netherlands that people are working on. So I think our people want to know what we're going to do to be aggressive here, both with the public and private sector.

So I think we saw CHIPS and Science as an opportunity to make sure we were doing that.

Robert Pearce: And thermoplastics is one of those areas that we are - one of the material systems we're focused on. We're trying to be very objective about which material systems will provide the best performance with respect to the application that's being desired. So we're kind of trying to keep that application open.

Senator Cantwell: In your testimony [you] mentioned, I think you called it GRX-810 new composite materials?

Robert Pearce: It's actually a metallic alloy system used for very high temperatures. For example, in turbine engines, where you're exposing these materials to very high temperatures this GRX-810 could be a good innovation in that space.

Senator Cantwell: So we just need to get a big banner that says "material science is key for aviation's future"? I see everybody nodding.

Robert Pearce: It is critical.

Senator Cantwell: But I don't know that we've said it so specifically and we need to because the material science aspect of this is really important and obviously then the minerals and everything else.

Mr. Hegeman, David Calhoun, CEO of Boeing, has said a new U.S. major aircraft program will not be announced until 2030. And that we wouldn't expect a U.S. commercial airliner, a new one, to be built [and enter] in[to] service until 2035 at the earliest.

I think part of what they're waiting for is what they think is clarity and leaps in energy [and] engine technology. Do you agree with that timeframe?

Arjan Hegeman: Yeah, we're working very hard on maturing our technologies and demonstrating that they are safe and durable for engine programs that can move into a certification type effort. So for the next couple of years, this decade, we have a series of demonstrators that do exactly that.

Once that is completed, and you have shown that indeed these technologies are delivering and are safe, at that point you kick off the design effort and a certification effort towards those new applications, which then would fall sometime in the 2030s.

Senator Cantwell: What is going to be the additive advantage, how would you describe it?

Arjan Hegeman: The additive, I'm sorry?

Senator Cantwell: What do you think is the engineering efficiency that you're going to get out of the next engine?

Arjan Hegeman: The fuel efficiency that we're going after is more than 20%, which is significantly more than what you traditionally get in a generational update.

Senator Cantwell: And you're going to do that, again, by these material science issues, or…

Arjan Hegeman: A lot of it is material sciences. We have in our LEAP engines we've introduced new materials, ceramic matrix composites, that are more temperature resistance than any metal, they are lighter, they are stronger.

That path is continuing in our technology growth, which gives you thermal efficiency inside the engine. It's a very large part of what the next generation engines will continue to improve on.

The other large part is the propulsive efficiency, which is our open fan architecture.

Senator Cantwell: Thank you.

Thank you, Madam Chair. I will definitely have more questions but yield to my colleagues.