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MOVING UPWARDS AND ONWARDS: THE WORKFORCE AND INNOVATION NEEDS OF THE AVIATION AND AEROSPACE INDUSTRY

HEARING

BEFORE THE

SUBCOMMITTEE ON INNOVATION, ENTREPRENEURSHIP, AND WORKFORCE DEVELOPMENT

OF THE

COMMITTEE ON SMALL BUSINESS
UNITED STATES
HOUSE OF REPRESENTATIVES

ONE HUNDRED SEVENTEENTH CONGRESS

SECOND SESSION

HEARING HELD
MAY 12, 2022

Small Business Committee Document Number 117–055
Available via the GPO Website: www.govinfo.gov

U.S. GOVERNMENT PUBLISHING OFFICE

47–536 WASHINGTON : 2022

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MOVING UPWARDS AND ONWARDS: THE WORKFORCE AND INNOVATION NEEDS OF THE AVIATION AND AEROSPACE INDUSTRY

THURSDAY, MAY 12, 2022

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SMALL BUSINESS,
SUBCOMMITTEE ON INNOVATION, ENTREPRENEURSHIP,
AND WORKFORCE DEVELOPMENT,
Washington, DC.

The Subcommittee met, pursuant to call, at 10:00 a.m., in Room 2360, Rayburn House Office Building, Hon. Jason Crow [chairman of the Subcommittee] presiding.

Present: Representatives Crow, Houlahan, Young Kim, Luetkemeyer, Williams, Tenney, and Garbarino.

Chairman CROW. Good morning. I call this hearing to order.

Without objection, the Chair is authorized to declare a recess at any time.

I would like to begin by noting some important requirements. Standing House and Committee rules and practice will continue to during hybrid proceedings. All Members are reminded that they are expected to adhere to these rules, including decorum.

House regulations require Members to be visible through a video connection throughout the proceeding, so please keep your cameras on. Also, please remember to remain muted until you are recognized to minimize background noise.

In the event a Member encounters technical issues that prevent them from being recognized for their questioning, I will move to the next available Member of the same party and I will recognize that Member at the next appropriate timeslot provided they have returned to the proceeding.

The U.S. aviation and aerospace industry is crucial to our national security and national defense capabilities. From commercial airliners to telecommunication satellites, the aerospace industry touches the lives of countless Americans every day.

The industry also provides meaningful employment to over 2 million workers. These are great paying jobs that allow workers to further their careers and support their families. In 2020, aerospace workers averaged roughly $104,000 in wages and benefits.

The impact of this industry extends beyond U.S. borders. Domestic aerospace companies are global leaders that export civil and military products to countries worldwide. In 2020 alone, the industry generated $874 billion in total industry sales revenue.

The impact of this industry is big, but small businesses make up a substantial portion of the sector. For example, small entities comprise more than 90 percent of businesses in airline transportation, air transport support, and aviation manufacturing.

Despite the successes of the aerospace industry, COVID has presented unprecedented challenges. Travel restrictions around global air traffic to a near halt in the early days of the pandemic. Since then, new variants and intermittent rising case counts have continued to depress commercial aviation's recovery. In January of this year, flights operated stood at 85.3 percent of pre-pandemic levels.

But even with this decreased demand, companies are struggling to hire the right workers to keep up with the supply. This problem is not confined to the aerospace industry. Small businesses across the country are feeling the effect of an overall labor shortage. This worker shortfall is complex and connected to pandemic-related issues, like decreased legal immigration, early retirements, and a lack of childcare options for working parents.

But even before the pandemic, the aerospace industry faced labor issues, including an aging workforce and the need to constantly upskill workers due to innovation.

These problems have led to shortfalls in vital positions, including pilots and mechanics, and staffing shortages have led to record flight cancelations throughout early 2022, creating significant disruptions for travelers.

The implications of this labor shortage also extend to our military. Studies predict significant shortfalls for Air Force and Navy pilots very soon. This is simply unacceptable.

If the aerospace industry cannot find an adequate number of trained workers, our economy and national security will suffer. That is why we must use the tools at our disposal to ensure that workers have the necessary skills to fill these positions.

The FAA Reauthorization Act of 2018 and the National Defense Authorization Act for Fiscal Year 2020 added training grants for the pilot workforce alongside aviation maintenance technical workers. The aerospace industry has also embraced apprenticeships as a model for attracting young workers and equipping them with the necessary skills to succeed.

So today, we will deepen our understanding of this industry, examining these workforce initiatives and other policy solutions that can support workers in the aerospace sector as we work toward recovery.

I would now like to yield to the Ranking Member, Mrs. Kim, for her opening statement.

Ms. YOUNG KIM. Thank you, Chairman Crow. I want to thank you for holding this hearing, and I want to thank all of our witnesses for testifying today.

Over the past few years, small businesses within the aviation and aerospace industries have been met with unparalleled economic headwinds, including labor shortages, supply chain disruptions, and soaring costs. These industries are vital to our economy as they produce both military and civil aircrafts, facilitate trade and tourism, and connect Americans worldwide.

Small businesses play a key role in aviation and aerospace. According to the Census, statistics of the U.S. business, 94.3 percent

of all firms that provide air transportation are considered small businesses and almost 88 percent of aerospace firms are small businesses.

One of the biggest challenges these firms are facing is the unprecedented labor shortage. The most recent Job Openings and Labor Turnover Summary reported 11.5 million job vacancies. To make matters worse, employers continue to face record numbers of workers leaving their jobs. And in March, 4.5 million workers quit their jobs.

These trends persist, even as nearly half of small business owners have reported job openings they could not fill. Worker shortages are not a new issue to the aviation and aerospace industries. In fact, this Committee held a hearing back in 2018 on this exact issue.

Unfortunately, COVID-19 exacerbated the shortages by encouraging early retirements among airline and aerospace workers uncertain about their career prospects in a sector that was almost entirely shut down for months.

According to the Regional Airline Association, the United States will lose about half of its pilots to retirement in the next 15 years. Further, a recent study found a lack of technical staff as the top disruptor for the aviation maintenance and repair sector over the next 5 years. A pilot and technician shortage affects not only the airlines but also the millions of Americans who fly each year.

Another issue that is contributing to the worker shortage is the growing skills gap. These sectors rely on highly skilled workers to build aircrafts, satellites, missiles, and conduct maintenance and safety tests.

According to a recent study by Deloitte, the manufacturing skills gap in the United States could result in 2.1 million unfilled jobs by 2030. The cost of these missing jobs could total $1 trillion in 2030 alone. The lack of skill labor is a major concern, and if not addressed, could have serious impacts on our economy.

From finding and retraining skilled labor to supply chain issues and skyrocketing costs and disruptive inflation and energy prices, our small businesses are facing a multitude of economic hurdles that threaten to close their doors.

I look forward to hearing from our witnesses today on how we can better support you, and I hope to work with my colleagues to find real solutions to elevate the increasing economic challenges that our small businesses are facing every day.

Thank you, and I yield back.

Chairman CROW. Thank you, Mrs. Kim. The gentlelady yields back.

I would like to take a moment to explain how this hearing will proceed. Each witness will have 5 minutes to provide a statement and each Committee Member will have 5 minutes for questions. Please ensure that your microphone is on when you begin speaking and that you return it to mute when finished. We run a tight ship here, Mrs. Kim and I, so please stick with your 5 minutes so I do not have to gavel you out.

So with that I would like to introduce our witnesses.

Our first witness is Mr. Eric Fanning, President and CEO of the Aerospace Industries Association, the leading advocacy organiza-

tion for the aerospace and defense industry. He has more than 25 years of distinguished government service. He previously served as Chief of Staff to the Secretary of Defense, Acting Secretary of the Air Force, and Deputy Undersecretary of the Navy. In 2016 and 2017, he served as the 22nd United States Secretary of the Army. He is the only person to have held senior appointments in all three military departments and the Office of the Secretary of Defense, which actually raises the question for me is when you tell military jokes, which service do you make fun of? So thank you, Mr. Fanning for joining us. I look forward to your testimony.

Our next witness is ML Mackey, co-founder and CEO of Beacon Interactive Systems and Division Chair of the National Defense Industry Association Small Business Division. Ms. Mackey is an innovator and entrepreneur. Her company, Beacon, is a valued and rapidly-growing provider of mission-critical systems to the Department of Defense that helps drive efficiency, improves sustainability, and unleashes productivity. She is an advocate for small businesses, women's leadership, and STEM innovation. Ms. Mackey is an active Member of the NDIA's Workforce Project, and in 2021, served as the Board Chair of the National Small Business Association. Welcome, Ms. Mackey. It is a pleasure to have you on the panel.

Our third witness is Mr. Blake Scholl, the CEO of Boom Supersonic, an end product supersonic aircraft company based in my district. Mr. Blake started Boom in his basement in September 2014 with the goal of making high-speed travel mainstream and enabling a new world of human connection. Prior to founding Boom, he held a leadership role at Amazon and cofounded the mobile tech startup, Kima Labs, which was later acquired by Groupon. Thank you, Mr. Scholl. I look forward to hearing about your experience.

I will now yield to the Ranking Member to introduce our final witness.

Mr. LUETKEMEYER. Thank you, Mr. Chairman and Ranking Member. I would like to welcome our final witness who is from my district, Ms. Judy Burns. Ms. Burns is the president and cofounder of Patriot Machine, Inc. Her company is headquartered in St. Charles, Missouri, which is in the eastern part of Missouri's 3rd Congressional District. Ms. Burns and her husband started this small business more than 30 years ago and the company has since expanded to 160 employees. Patriot Machine is a globally competitive aerospace manufacturer supplying highly complex structural parts and assemblies to America's largest aircraft manufacturers. The company prides itself on its cutting edge technology, skilled workforce, and advanced planning techniques. Patriot Machine continues to exhibit growth by recently adding a new advanced manufacturing facility with ample space for further expansion. Under Ms. Burns' expert leadership, Patriot Machine has received the Supplier of the Year Award on three separate occasions from the Boeing Company. Ms. Burns' other recognitions include Missouri's First Lady Award for success in the field of business innovation and the 2015 University if Missouri St. Louis Distinguished Alumni Award. I know Ms. Burns' experience as a small business owner and vast knowledge on innovation and workforce issues will be extremely beneficial to our hearing. Welcome, Ms. Burns, and thank you for taking time to testify before us today.

And with that, Mr. Chairman, I yield back.

Chairman CROW. Thank you. The Ranking Member yields back.

Thank you all for joining us today. Mr. Fanning, you are recognized for 5 minutes.

STATEMENTS OF ERIC FANNING, PRESIDENT AND CEO OF THE AEROSPACE INDUSTRIES ASSOCIATION; M.L. MACKEY, CEO AND A CO-FOUNDER OF BEACON INTERACTIVE SYSTEMS; BLAKE SCHOLL, FOUNDER & CEO, BOOM SUPERSONIC; JUDY BURNS, PRESIDENT, PATRIOT MACHINE

STATEMENT OF HON. ERIC FANNING

Mr. FANNING. Thank you, Chairman Crow, Ranking Member Kim, and Members of the Committee. Thank you for inviting me to be part of today's hearing. My name is Eric Fanning and I serve as the President and CEO of the Aerospace Industries Association (AIA). For over 100 years, AIA has advocated for America's aerospace and defense companies and the more than 2 million men and women who are the backbone of our industry.

AIA thanks this committee for its ongoing leadership in listening and learning from A&D industry leaders to support and strengthen our industry. A crucial part of this effort is rightfully focused on our world-class workforce, which remains the bedrock of our industry's success. These men and women bring unparalleled experience and expertise, as well as tremendous heart to their work on behalf of America's military and our aviation transportation system.

The A&D manufacturing base is a strategic asset for our nation, and the workforce is its cornerstone. The pandemic underscored how essential these employees are and reminded us of the unique capabilities they bring to bear in support of our security and safety each day. Without question, addressing our 21st century workforce needs is vital to our missions, our customers, and to America's national and economic security.

Addressing the workforce needs of the A&D industrial base requires a strong partnership between government and industry. There are several ways AIA would like to work with government leaders and Congress to address these needs. This includes investing in STEM education, reskilling current employees for new technologies, expanding our country's training efforts to broaden talent pools, and increasing workforce diversity and inclusion efforts within the A&D industry.

The workforce is strong but challenges persist. Economic conditions like record inflation and the length and severity of the pandemic are adding pressures to the budget, affecting the cost of personnel, goods, and services. This has a direct impact on employment, and ultimately, our customers. These concerns were top of mind when our Supplier Management Council assembled in New Hampshire a few weeks ago. Like so many in the U.S., the pandemic created unprecedented challenges for our workforce. In 2020 alone, decreasing demand for products due largely to the reduction in air travel cost our industry 87,000 jobs. Approximately 64 percent of these losses came from the shared A&D supply chain, comprising of thousands of small and medium-sized businesses. Inflation is exacerbating the continued pressure on employment.

Another challenge the A&D industry faces is the aging of our workforce. An estimated 26 percent of our industry employees are over the age of 55, slightly higher than the U.S. total workforce. Given this disparity and a projected increase in retirements, it will be imperative to retain and develop the mid-career workforce, while also continuing to attract top talent.

AIA and our Members are committed to strengthening the diversity, equity, and inclusion throughout our industry. I say more about this in my written testimony, but our companies are investing significant resources into the attraction and recruitment of diverse candidates to ensure we are accessing the full breadth of what the country has to offer and to build stronger teams.

How can industry partner with government to support and strengthen the A&D workforce? Congress can expand federal support for apprenticeships and career technical education, while also removing barriers that are preventing companies from effectively competing for highly-skilled talent. This includes addressing the lengthy security clearance process which is historically slow and bureaucratic, leading to staffing delays and slowdowns for important national security projects.

Additionally, Congress must address the harmful research and development tax change that went into effect in January 2022 that reduces cash flow and in turn will affect employment. Nearly 70 percent of R&D spending is for wages and salaries. This means that R&D spending is an investment in America's workforce, as well as innovation.

At a time when we need to stay ahead of the growing competitive threat from China, we must continue to build and strengthen our world-class workforce. It is our employees that are incubators of innovation. Their skill will usher in the next generation of advancements that transform and empower our country in the world. We urge Members to delay this tax change during the bipartisan Innovation Act negotiations.

Thank you for having me today for this important and timely hearing. I look forward to your questions.

Chairman CROW. Thank you, Mr. Fanning.

Ms. Mackey, you are recognized for 5 minutes.

STATEMENT OF M.L. MACKEY

Ms. MACKEY. Chairman Crow, Ranking Member Kim, and Members of the Committee, thank you for inviting me to appear before the Innovation, Entrepreneurship, and Workforce Subcommittee today. And thank you for your consistent efforts in supporting America's small business community.

My name is ML Mackey, and I am the CEO of Beacon Interactive systems. Beacon delivers innovative, efficiency improving, digital capabilities to the U.S. Air Force. I am also here today in my role as the Chair of the Small Business Division of the National Defense Industrial Association (NDIA), the nation's oldest and largest defense industry association, comprised of nearly 1,800 corporate and over 63,000 individual members.

So the challenge facing the aviation and aerospace industry today is a workforce challenge. How do we increasingly grow the innovation workforce to address both current and future needs?

Whether it is a focus on the scientists and engineers developing and delivering innovative technology or the maintenance technicians, the airmen on the flight line, maintaining and sustaining aircraft, there is a workforce shortage across the board. To be successful we can either increase the workforce so that we have more people available, or we can increase the capacity of the resources in place. The most successful outcome will be an artful combination of the two.

Using Beacon as an example, participating in federal R&D programs not only enabled us to further develop technology innovation for the maintainers on the flight line, it also enabled us to further develop our own innovative workforce. This developmental impact in terms of becoming an ever more innovative team is the multiplier effect of federal R&D funding.

It is important to call out that the innovation workforce is not only comprised of the technical resources typically thought of in STEM discussions, but also the wider team of innovation thinkers necessary to bring a successful product forward. It includes the program managers, the analysts, and the extended teammates of our Air Force colleagues on the flight line. This is the diversity of thought and creativity that fuels successful innovation. This is the team federal R&D funds let us explore, find, and push the envelope to develop.

Without this well-developed intentional diversity of thought, innovation happens in one-off moments not as the continuous engine critical to U.S. national security needs and the country's economic prosperity.

At this point I would like to broaden the discussion to bring in input and recommendations from my fellow NDIA colleagues.

At NDIA, we talk a lot about workforce training. The success and growth of the aerospace and defense industry is reliant on a robust and talented workforce. Technicians are a critical component to the overall operational safety of the industry and are playing a vital role in supporting the pandemic recovery efforts.

Boeing's recently released Pilot and Technician Outlook 2021-2040 forecasted that 626,000 new maintenance technicians will be needed to meet operator and MRO demand to maintain the global commercial aviation fleet over the next 20 years. Maintenance technicians will play a critical role in restoring, inspecting, and preparing aircraft that have sat idle during the pandemic to meet airworthiness standards. As importantly the industry will need an influx of technicians familiar with electrical and hybrid motors and components to keep pace with the emerging advanced air mobility sector.

The recommendation here is to both continue and accelerate investment in federal workforce training programs for upskilling of the existing workforce, as well as outreach efforts for future workforce development.

Another topic we frequently discuss at NDIA is procurement visibility. The need for a clear demand signal from the federal government, while important across all industry participants, is especially true for small business. This is not limited to just to procurement or research and development; it is also needed for businesses providing aerospace services, spare parts, and support.

A critical step the federal government, and particularly DoD, could take to send a clearer demand signal to industry regarding its priorities for aerospace systems' sustainment would be to provide additional detail in the operations and maintenance budget request regarding the materiel availability objective for each major weapon system and the resources required across the FYDP to achieve that objective.

That kind of accountability and transparency on the part of the federal government would enable greater investment in innovation and workforce development.

In closing, I will give voice to a third recommendation, which is more about how to think about federal R&D than actual steps to take. I am going to suggest we collectively adjust our thinking on R&D funding from a singular engagement to more of a continuum; that it should be viewed as more than just the specific outcome of the specific R&D funding. It should be understood as a continuous investment in developing the innovation workforce critical to the aviation and aerospace industry.

With that, I will close my remarks. Again, I would like to thank you Chairman Crow, Ranking Member Kim, and Members of the Committee. Thank you for the opportunity to appear before you this morning and thank you for your continued efforts in helping the small business community.

I would be pleased to respond to any of your questions.

Chairman CROW. Thank you, Ms. Mackey.

Mr. Scholl, you are recognized for 5 minutes.

STATEMENT OF BLAKE SCHOLL

Mr. SCHOLL. Well, good morning, Chair Crow, Ranking Member Kim, Members of the Committee. Thank you for having me here this morning.

I am Blake Scholl, founder and CEO of Boom Supersonic, and I am pleased to talk about the importance of entrepreneurship, innovation in U.S. aerospace, and our efforts to safely and sustainably return supersonic passenger flight.

At Boom, we have already built and tested XB1, which is history's first independently developed supersonic jet. In our hangar just outside of Denver, we have the world's only operational nonmilitary supersonic jet, and we are well on our way to launching a Supersonic Renaissance with manufacturing starting in 2 years where we will create thousands of jobs in our super factory in North Carolina.

But big things start small. Not that long ago, Boom was a tiny band of innovators in my basement in Denver building a supersonic airliner markup out of cardboard, plywood, and chairs from Office Depot.

At Boom, we believe in a world in which more people can go more places more often, and we are redefining long distance travel with Overture, our supersonic commercial airliner. And we are proud especially to be part of an American manufacturing renaissance that is so desperately needed in our country.

We are developing our Overture airline to satisfy three objectives: speed, safety, and sustainability. Aboard Overture, London is just 3.5 hours from New York, and Sydney, Australia, will become

as accessible as Honolulu is today. Ultimately, we envision a future in which all can benefit from high-speed flight and making the planet more accessible.

Increasing travel speeds fosters greater human connection, but here in 2022, we actually fly no faster than we did 65 years at the dawn of the jet age, and I think that statis in innovation in aerospace is a big reason why we have workforce challenges. We have not inspired young people to enter careers in aerospace.

But small startups are changing the face of innovation and aviation. They are innovative, nimble, and able to take risks. And this mindset is what propels startups to bring revolutionary products, like a supersonic airliner to the market. Businesses that do great things all start small. And thanks to fundamental advancements in the aviation industry and at Boom, safe supersonic flight will now be comfortable, affordable, and sustainable.

And this acceleration in flight is possible thanks to a revolution in clean energy. Historically, revolutions in energy have powered improvements in the speed of travel. In the 19th century, coal powered the transition from sail to steam and from horses to railroads. In the first half of the 20th century, oil powered the transition into airplanes. In this decade, a revolution in alternative sustainable fuels will power the transition to supersonic flight.

It takes new entrants like Boom to change the fundamental paradigm of travel, both in terms of speed and sustainability. And it is important to note that the United States is not the only country developing supersonic aircraft. China and Russia are very visible investing in speed.

The U.S. has long been a global leader in aerospace, and at Boom, we are determined to see the country remain at the forefront of innovation. And we are grateful for the early support we have received from both commercial and military sectors. United Airlines has purchased 15 of our aircraft with an option for another 35, a deal that brings our order book to 70 aircraft. And by comparison, only 14 Concords ever entered service.

The supersonic technology we are developing will also give new strategic options to the U.S. military. The outbreak of war in Ukraine has shown us how important it is to get critical people and critical things where they need to be quickly, and in the future, supersonic capability will enhance the effectiveness of American leaders, diplomats, and servicemembers.

Through the Small Business Innovation Research program, we are also proud to have two contracts with the Air Force. Our most recent is a 3-year strategic cost-share STRATFI, strategic funding increase partnership which is a dollar for dollar match between the Air Force and Boom to accelerate R&D on Overture. But in reality, taxpayers are getting an even better deal. The Air Force is leveraging our private capital and there are 10 investor dollars for every 1 dollar the Air Force has committed.

By teaming with Boom, the Air Force gets in on the ground floor of a transportation revolution that can continue to build U.S. air superiority. The Air Force's interest in our work sends a powerful signal to our investors, customers, and partners, validating the viability of our aircraft, and the SBIR program allows the Air Force

to mature technologies down the road. When we are ready for procurement, the technology is ready and the option is there.

To ensure that U.S. leadership in aerospace endures, government must continue to partner with innovative small business to nurture innovation and to facilitate the next generation of aerospace technology and inspire people to go into the field.

So thank you very much for having me here today, and I look forward to answering your questions.

Chairman CROW. Thank you, Mr. Scholl.

Ms. Burns, you are now recognized for 5 minutes.

STATEMENT OF JUDY BURNS

Ms. BURNS. Chairman Jason Crow, Ranking Member Young Kim, Congressman Luetkemeyer, and other distinguished Members of the Subcommittee, thank you for the opportunity to testify in this hearing, and thanks much for the opportunities that allow small businesses to participate in the aerospace and defense industry.

I am the president and cofounder of Patriot Machine. Over the past 31 years, my company has grown from my home's garage into a globally competitive aerospace manufacturer with 160 employees. Headquartered in St. Charles, Missouri, we supply a variety of highly complex structural parts and assemblies to America's largest aircraft manufacturers. From the beginning, innovation has been the key to thriving in a highly competitive environment. The long-term health of our company depends on regularly integrating new technologies and continually finding new and better ways to improve operations. While we pride ourselves on our culture of continuous improvement and problem solving, there are some challenges we cannot take on alone.

The labor shortage in America affects all businesses. At Patriot Machine, we have seen a marked decline in the number of skilled applicants since early 2020. Increasingly, we are training new hires on the job because they come to us without the necessary manufacturing skills. We are developing internal programs that emphasize structured, on-the-job training, and mentorship, and also provide financial support for education that applies to our industry. The costs of recruiting, onboarding and training new hires are significant, particularly if those employees leave the company after a short period of employment, which sometimes happens with new hires who are not yet sure what career path they want to follow. We know employees are looking for opportunities to learn and grow and we are committed to helping them. This is why we would like to see an increase in federal funding for technical education and community college programs with a technical focus to help prepare the incoming workforce for careers in aerospace manufacturing.

Meanwhile, the aerospace industry's supply chain disruptions and rising prices in our sector have only worsened in the perfect storm of recent events. The price and lead-time of raw materials has doubled. Labor force issues, rising costs and other factors have caused our suppliers to increase their pricing significantly. Yet even under these volatile conditions, Patriot is bound by long-term fixed price contracts with our customers.

I encourage you to keep these challenges in mind when making decisions on the 2023 defense budget. The increase currently outlined, while helpful, does not provide significant growth due to inflation. Aerospace companies like ours depend on strong support for advanced development programs, which is R&D basically, and for our existing production programs. A combination of both helps us to stay ahead with technology, but also adds support for long-term stability.

Lastly, we are a capital-intensive business with a need to make serious financial investments in assets that often do not pay off for years. This is especially true of the acquisition of our high-tech machinery and equipment, which can take several years between the initial purchase, manufacture and installation. Hiring, training and retaining individuals capable of programming and operating this equipment takes significant investment as well. Rising interest rates will make these acquisitions harder, too. One item which helped manage these high-cost hurdles was the Tax Cuts and Jobs Act of 2017, which temporarily increased the allowance of bonus depreciation to qualified property to 100 percent of the value of assets acquired that year. However, that percentage will be phased out by 2027. An extension of these benefits, and perhaps even a way of making these benefits known in advance and permanent, would help Patriot Machine and other small businesses plan for the future.

Thank you again for letting me share my perspective as a small business owner in the aerospace manufacturing industry. Your investments in aerospace projects allow us to continually improve technologies and develop the next generation of the workforce and industry leaders

Chairman CROW. Thank you, Ms. Burns.

I will begin by recognizing myself for 5 minutes.

Mr. Fanning, starting with you, there has been a lot of discussion about reinvigorating the U.S. manufacturing base, onshoring things that we lost in the 1980s and the 1990s to create the ecosystem again, particularly in advanced manufacturing, yet it remains a very sticky challenge of how we find that workforce again that we lost over the last couple of decades, those skills. I would love your thoughts on what is the best way for us to redevelop that pipeline of skilled workers, particularly with respect to advanced manufacturing?

Mr. FANNING. Thank you for that question. That is something we spend a lot of time thinking about. Obviously, we are in strong favor of American manufacturing, but we are a big exporting industry as well, and so we recognize the importance of the global markets in that way.

There are a number of things that we saw from COVID that point to what we would like to bring back to the United States, chips being one of them. I think we have cut in half the production of chips in the United States as we look for cheaper labor elsewhere. But as you pointed out, there is a labor problem already, which is slowing the recovery. A number of our businesses think they could recover faster and do more quicker if they just had access to the workforce.

I think one of the big things is what programs are out there to train for what. I remember Secretary Acosta saying when he was labor secretary in the previous administration that he was down in Florida talking about needing to train for machinists, and a university said, we will create an associate degree program for that because that is the only money they could get access to from the federal government. So these are good, high-paying jobs that require high skills, so leaning into and investing more on the government side in apprenticeships, work study programs, and really targeting where we can go after underrepresented communities. That is a whole category, a whole group of people that we are not accessing and should be accessing and helping them get on paths for these jobs.

Chairman CROW. And will that require us reaching into K through 12 and really starting that pipeline earlier and, you know, are there any programs that you think would help, you know, really invigorate people's interest frankly in middle school and high school in this area?

Mr. FANNING. Even elementary school. I think you are absolutely right. We want to get the big end of the funnel as big as possible. I mean, our experience with STEM education is it is a series of offramps. You lose kids when they lose from elementary school to junior high, junior high to high, high to college. You are not finding people that are coming in later in life because they do not have the skills that they need that they learn in math and basic science. And so there are programs, NASA, FAA, Department of Education that try to inspire kids into STEM as early as elementary which is important because then you need to get them all the way through high school to get them into these other types of programs that we are talking about, the apprenticeship programs.

Chairman CROW. Thank you.

Mr. Scholl, we had a chance to talk earlier about the SBIR program and obviously, one of the things we talk about a lot within this industry and context is the issue of the so-called "Valley of Death," you know, where you have a lot of great ideas and companies that fall off before they can really bring things to scale and bring things to market. So I would love to get your views on that and the importance of programs like the SBIR program for companies like yours.

Mr. SCHOLL. Yeah, I think the SBIR program is super important as a bridge from zero to one for new technologies. Without that, for example, with the Air Force, we would have to go from nothing to having a product that is ready for a program of record procurement process. And the hurdle for that is very high. And what SBIR does is allow the DoD, the Air Force, to signal interest in a future product to encourage private sector development of that product before it is ready to be purchased. So it helps bridge that "Valley of Death." It helps bring things along and ensures that the U.S. has an option to procure an innovative product when it is ready.

Chairman CROW. Thank you.

Ms. Mackey, comments on either of those questions, or both of them?

Ms. MACKEY. Diversity in innovation is really about diversity. So I am intrigued by the experience that you have about bringing a product forward. I also find in the SBIR pipeline that there is an idea and a thought more than a product. So there are these different paths that I think are all valuable and really important to the process.

I will share our experience with the SBIR program was about bringing a capability forward that manifested into a product idea during the SBIR initial investment, and then beyond that transitioned to the Navy and now it is transitioning to the Air Force. So I think the SBIR program is a really important piece of our economy. I think it is also important to the workforce in that it lets us try innovative new things that otherwise as a small business we might be more conservative on. It lets us attract the workers that you were talking about into doing interesting work.

Chairman CROW. Great. Thank you. My time has expired.

The Ranking Member, Mrs. Kim, is now recognized for 5 minutes.

Ms. YOUNG KIM. Thank you.

I would like to ask my first question to Ms. Burns joining us virtually. Thank you.

In your testimony, you reference the many challenges of being a small business owner, including labor shortages, inflation, and supply chain disruptions. So these are the hurdles that we heard from other businesses as well. And they do impact businesses in this similar industry. So how is your business managing with all these economic headwinds?

Ms. BURNS. Thank you. Thank you, Congressman Kim.

We are taking it all in as much as possible. One of the things during COVID that was very helpful was the PPP funding and then also——

Ms. YOUNG KIM. We have technical difficulty.

Ms. BURNS. Sorry. Sorry.

We were critical infrastructure during COVID, which was very good because it allowed our workforce to continue to work through all of the COVID difficulties. We were in the middle of building a new building, which we were able to continue doing and we are ready for new work opportunities now. And we have our new equipment installed. Fortunately, before, the interest rates were low but now going forward interest rates are rising. That will be more difficult. We are doing the best we can of bringing in whoever we can to train and work on jobs but we are very, very, let's see, highly technical. So it does take a lot of training.

Ms. YOUNG KIM. So you mentioned that your company provides internal workforce development programs to train and mentor your employees. So can you tell us a bit more about the types of programs you offer? And what is the biggest challenge your small business faces in training your workforce?

Ms. BURNS. Well, we, let's see. We do a lot of different things for training. When we onboard people, we have a lot of different things we have to train on—safety, different processes, equipment. We have a lot of very tight tolerances on our parts, less than like a hair's thickness. Then we have to measure them and make sure they are all made to order correctly. And we just are, let's see, put-

ting in processes to make sure that everybody gets the training they need. So, we just do the best we can.

Ms. YOUNG KIM. Thank you very much. Thank you.

I want to move on to Mr. Fanning. In your testimony, you discussed the AIA Members launching a successful apprentice program at Valley Community College in San Bernadino. My district has parts of San Bernardino. How has this program helped meet the company's labor demands and bring new employees to the sector?

Mr. FANNING. The company is CAS, Certified Aviation Services I think in your district. It is a great example of a public-private partnership. So they join forces with the local community college and provide on-the-job training actually on the aircraft that they are servicing, and 70 hours of that program, of that worktime, counts towards the degree. And it provides a pipeline since those students, while they are getting their certificates, are already working at CAS. They are more inclined and CAS wants to capture them if they can.

Ms. YOUNG KIM. And those are the things we want to highlight. So what can we do in Congress and as Members who represent those, like your community college, to highlight and raise awareness for apprenticeship programs like that?

Mr. FANNING. Well, I think the demand exceeds what is available for some of those programs. So if we could increase the funding for those apprenticeships to provide for the schools, that type of training that the companies can tap into and partner with, I think you will see the demand will grow with whatever the funding is available for those partnerships.

Ms. YOUNG KIM. What I am hearing is a lot of funding. Continue funding that is working.

Mr. Scholl, how has your business recruited the next generation of skilled labor in the past? I know you talked about bringing the new generation and want to make sure that this industry has more next generation that is interested in continuing the work?

Mr. SCHOLL. Thank you.

I think the most important thing is inspiration. People at very early ages decide what is going to be exciting to go into and what they can see themselves going into. And so reaching our young people, yes, I think going all the way back to kindergarten, if not sooner, and help ensure people from all walks of life that exciting things are happening, innovation is happening in aerospace, and supporting them all the way through their career so they can go do something amazing, not just go and work on a new app for a cellphone.

Ms. YOUNG KIM. Thank you. I think my time is up so I will yield back. Thank you.

Chairman CROW. The gentlelady yields back.

I will now recognize the gentleman from Texas, Mr. Williams, Vice Ranking Member of the Committee, for 5 minutes.

Mr. WILLIAMS. Thank you, Mr. Chairman, and Ranking Member Kim. We talk about garages a lot today. It speaks pretty well for garages. So I want to congratulate you all. And I want to thank the witnesses for being here today. I appreciate that.

As a small business owner for over 50 years—I am a car dealer so we can talk about supply chain and some stuff—but 51 years. I still own my business, employ hundreds of people back in Texas. I know firsthand that we are always looking for more mechanics, technicians, and other technical workers as we talked.

Our country is facing a growing skills gap as younger generations are not joining the vocational workforce—we have talked about that—at a high enough rate that we need. And I was pleased to see that my bill, the Supporting Small Business in Career and Technical Education Act passed this Committee in our markup yesterday which provides CTE graduates with additional support as they enter the skilled workforce. While this bill is a great first step in connecting CTE professionals and as a lot of kids are dropping out of school they need this so they can realize they can do other things and not go back to school. Congress and the Biden administration need to do more to address the technical worker shortage that is hurting industries across the country. And of the business owners trying to currently hire workers, we talked about this this morning, an astounding 93 percent reported having only a few or no qualified applicants for the position they were trying to fill and that is because this administration is paying people not to work rather than to work and we have got to fix that.

So, Ms. Burns. I have a question for you. As an aerospace manufacturer, I know this technical worker shortage is not news to you. Would you elaborate quickly on the biggest challenges your small business is facing when recruiting and training skilled workers, and how is your woman-owned business adapting to this skilled labor shortage?

Ms. BURNS. Well, it is a challenge. And we are trying to get people however we can, basically. We are bringing in people that are in other career or maybe, you know, like other types of work that have not had more advanced training that can come in and grow their skills and their career in aerospace manufacturing. And sometimes they do not have, you know, schooling past high school and they are more mechanical and they like these types of jobs. And——

Mr. WILLIAMS. If I might interrupt you, it just shows that training is important and that sometimes you have to go get people from another company rather than training them; correct?

Ms. BURNS. Yes. Actually, we try not to do that too much but there are a lot of people who are switching between aerospace jobs who are getting recruited to other aerospace companies as well.

Mr. WILLIAMS. Well, thank you. I will have another question for you here in a minute.

So, Biden is skyrocketing inflation. We talked about that. Everybody is affected with this inflation and we have got no fix to it right now according to this administration. Continues to create uncertainty and has replaced the labor shortage as the top concern for small business owners. And on top of that, the Bureau of Labor Statistics released its April Consumer Price Index reporting that consumer prices, and all of you saw this, increased by 8.3 percent, which is worse than experts expected. Plus, we have a negative GDP. Another month of raging inflation from this administration means more bad news for business owners like all of us. And so,

as a business owner when you get this, you have got to decide whether to reduce capital investment, lay off, or cut pay for employees, or pass the costs along to consumers in order to offset these increased costs, and that is not that easy to pass it on.

So these are difficult decisions business owners should not be forced to make, and so many people in Congress, my colleagues, never have to make it because they have never owned a business. That is a big problem.

So let me ask you this quickly, Ms. Burns. Can you expand on how the rising costs of goods and gas and labor has impaired your business and your customers? I am sure you cannot pass it on to consumers. You just in many cases have to expense it; right?

Ms. BURNS. Right. We are going to have to expense those costs. I am not quite sure how we are going to cover it yet but while we are increasing business, I would say there is one good thing in the business environment now. Since we are coming out of COVID there seem to be a lot of new opportunities, which I think, will help grow our business if we can make sure that we get enough qualified people to help expand.

Mr. WILLIAMS. And I think you touched on that, too. And everybody did here. The tax cuts that we passed in 2016, we need to make them permanent. Everybody is taking advantage of those. That is the debate we had back and forth between the two parties, but the tax cuts did as much to help this economy as anything, and I am glad to hear our witnesses say that.

So with that in mind, Mr. Chairman, I will yield back.

Chairman CROW. Thank you. The gentleman yields back.

I will now recognize the gentlelady from New York, Ms. Tenney, for 5 minutes.

Ms. TENNEY. Thank you, Mr. Crow, Chairman Crow, and Ranking Member Young Kim for holding this meeting. And thank you to the witnesses for your time, your insight, and being business owners in a tough economy right now.

I am honored to represent New York's 22nd Congressional District which stretches from the shores of Lake Ontario in the north, all the way to the Pennsylvania border and everything in between. This region has a strong innovation heritage and centuries of pioneers in the Industrial Revolution, starting back with the digging of the Erie Canal in my district. And it is also the birthplace of IBM, the headquarters for the Air Force Research Lab Directorate, otherwise known as Rome Lab, which is a greater center for innovation in our communities. The area around Rome Lab especially hosts a vibrant ecosystem of aerospace companies developing the future of drones and their potential to improve our lives and our national security. This is aided by the New York Unmanned Aerial Systems Test Site, which includes a state-of-the-art, 50-mile long testing corridor that stretches from Rome, New York, to Syracuse, New York. However, one of our biggest constraints holding back progress has been the bureaucratic uncertainty from the FAA and the federal government, as well as the inability to secure needed components. We need a federal rulemaking process that actively incorporates the needs of small businesses and not just the entrenched interests that tend to be larger. We also must ensure that regulators are fully transparent about their plans and intentions so

small companies can plan and adapt. The shortage of components is tied to the country's decades-long failure to curate a strong domestic supply chain and a line of important products and parts. As our aerospace industry increasingly pushes the boundaries of technology, it becomes more and more evident and important to ensure that our companies can access the semiconductors and the specialized components they need. This is a crisis for national security and our manufacturing capacity.

I want to first address my questions to Ms. Burns, and I want to say thank you for bringing up the 2017 Tax Cuts and Jobs Act and the need to make them permanent. That has been one of the greatest things that has happened to our small business community in upstate New York. We have finally gotten a breather from the oppressive tax and spend type of policies coming out of New York State from the federal side thanks to that Tax Cuts and Jobs Act. Not only has it give us more growth in terms of our small business community; it has given them a little bit of an edge against some of their bigger competitors. So thank you for that, and I appreciate my colleague mentioning it.

I wanted to first ask you though, in your testimony you wrote how the aerospace industry supply chain disruptions and rising prices have only worsened and that these constraints make it harder to carry out your long-term contracts with your customers. Would you be able to give an example of some important products that you are unable to purchase domestically and have to import from foreign sources and where you have to import them from?

Ms. BURNS. Okay. Thank you for the question.

We actually only use U.S. made products for our manufacturing. We do not outsource or have any foreign sources for our product. It is all U.S. made. But some of the prices in materials, such as aluminum, titanium, stainless steel, those types of things have, you know, some of them have gone up like double. Aluminum, for instance, is much more expensive than it was previously.

Ms. TENNEY. Is your aluminum and your titanium, are they domestically sourced through the companies or are they—obviosuly, they are coming from somewhere else.

Ms. BURNS. They are domestically sourced. Yes. So they are made in the U.S. and I do not know why but there seems to be a shortage of some things right now. A shortage of supply. I am not really totally sure why.

Ms. TENNEY. Thank you. I think it has to do with our policies.

I quickly want to ask Mr. Fanning a question, and thank you for your question, Ms. Burns.

You wrote that a January 2022 tax change has significant impacted America's innovators and their ability to recuperate some of their research and development expenses. Can you talk more about how this tax change is harmful and how it is hurting small businesses?

Mr. FANNING. The change that occurred this year was to amortize R&D investments over 5 years rather than getting the credit in the year the expense was made. Seventy percent of R&D comes out of the private sector, and 70 percent of R&D expenses go to wages and salaries. So it is good for the economy. It is good to attract new workforce, and it is good for small business because a lot

of small businesses are pulled into the research and development programs.

Simultaneous to that, China is doubling down and giving a 200 percent deduction for R&D expenses. And so we look at it both from an innovation standpoint but also from a national security standpoint that we are making a change that could disincentivize private investment in R&D.

Ms. TENNEY. Thank you for that. I appreciate it. And I think my time has run out so I yield back. Thanks, Mr. Chairman and Ranking Member.

Chairman CROW. Thank you. The gentlelady's time has expired.

I will now recognize the gentlelady from Pennsylvania, Ms. Houlahan, for 5 minutes.

Ms. HOULAHAN. Thank you. Thank you, Mr. Chair, and thank you to all of you all for being here today.

As an engineer and a former Air Force officer, I understand the very critical role that this industry and your industry plays in supporting our nation's defenses and to promote innovation across our economy. In my community in Pennsylvania, Boeing employs approximately 462 of my constituents contributing to an estimate $492 million of annual economic impact throughout Pennsylvania. The industry's impact reverberates across all of our local economies and supports small businesses in manufacturing and innovation. A common theme that I have heard in your testimonies is the need for greater federal investments in STEM and STEAM workforce development. To address this need, I have introduced a bipartisan STEM Restart Act to provide funding to small and middle-sized businesses, STEM businesses in particular, to offer robust, paid, mid-career internships, known as returnships, for mid-career workers. This would particularly benefit women who are seeking to return or transition into the STEM workforce.

For Mr. Fanning, could you please talk a little bit about how providing funding for flexible workforce development opportunities, such as the returnships that are created by the STEM Restart Act, would help address the workforce development and diversity challenges that are faced by the aerospace and defense industry?

Mr. FANNING. I think one of the things we have learned from COVID is the value of flexibility when you can afford it. And oftentimes, people leave the workforce because they cannot balance the competing needs they have outside of their job. And so providing that flexibility, recognizing it, implementing what we have learned during COVID we think will entice more people back into the workforce, and in particular, as you pointed out, women, which will help diversify our workforce.

Ms. HOULAHAN. I appreciate that. It has definitely been my personal experience that it was very hard to kind of balance everything when my family was young.

To Ms. Mackey, in your testimony you spoke about the importance of federal investments in Research and Development. On this Committee, I have introduced other bipartisan legislation that would enhance SBA's SBIR and STTR programs which have been shown to provide significant returns on R&D investments at the Department of Defense. Could you speak to the importance of reau-

thorizing these programs and share your views on how the program can be enhanced?

Ms. MACKEY. Yeah. So it is incredulous to many of my colleagues in industry, at trade associations, and the government that the SBIR is at risk of being reauthorized. What is it, $1.2 billion a year of innovation. And as you talked about, that first step to engage with the Department of Defense and bring mission critical technology forward.

So to your first point, it is almost ludicrous that we are even considering whether we should reauthorize it. But of course, we should reauthorize it and focus more on it. One of the things, I was at a Harvard Business School event 2 weeks ago with a lot of leadership from DoD and there were a lot of students look about how can we get into national security and how can we bring our emerging technologies and entrepreneurial interests forward? And one of the conversations was, and it is a lot like what you said, that SBIR is a gateway. I hesitate to call it a gateway but a gateway into the community that is an easy path into what is a different place than traditional commercial contracting. So we are a nontraditional defense contractor. The SBIR program let us first explore things that our more risk averse customers would not have explored. And then it exposed us to a whole new marketplace that is quite compelling in terms of personal satisfaction in what you deliver.

So I do not know if that answers your question or if there is anything else.

Ms. HOULAHAN. No, I appreciate that. Thank you. And with the limited the that I have left, I am really happy to hear that there is increased attention back to our conversation about diversity and inclusion in the aerospace industry, particularly with regard to female representation. According to AIA's 2021 Aerospace and Defense Work Study, only 25 percent of the workers in the industry are women. Additional data has shown that nearly 90 percent of professional airline pilots are white men.

So to Mr. Fanning, how is the industry making strides in training, recruiting, and retaining women as part of its commitment to increase diversity and inclusion? And what can we do to be helpful?

Mr. FANNING. Well, first of all, it is a priority because as we need to grow our workforce and are in a hunt for talent, we need to make sure that we are accessing everything that is out there. And so if we are leaving some parts of the country off the table, it is not going to be very effective for our recruiting efforts. Aerospace and defense companies are doubling down on efforts to provide mentoring, to provide paths for development and career growth and promotion, to recruit from different areas than they have in the past to try and find that talent. And we are, back to the other conversation, doing a number of things to attract people into STEM earlier. For example, we run the world's largest student rocketry challenge, and we just partnered with the Girl Scouts this year to get more girls into the program, get them excited about STEM, and then find paths for them through middle school and high school and into the industry.

Ms. HOULAHAN. Thank you. I know my time has run out. I will foot stomp again on the importance of returnships. I think we are

doing our very best to bring young girls along but we have to keep them once we get them.

So I appreciate it, and I yield back.

Chairman CROW. The gentlelady yields back.

I will now recognize the gentleman from New York, Mr. Garbarino, for 5 minutes.

Mr. GARBARINO. Thank you, Mr. Chairman. And thank you to the Ranking Member for holding this hearing. And thank you to the witnesses for being here.

A question for Mr. Fanning, and maybe Ms. Mackey can add on to what she thinks after he answers, but Mr. Fanning, the week before last, the Senate Armed Services Committee held a hearing regarding the health of the defense industry industrial base featuring the president/CEO of the Professional Services Council, David Berteau, and former Undersecretary of Defense for Acquisition and Sustainment, Ellen Lord. Our hearing focus today is a little bit broader than that but both witnesses spoke repeatedly about the need for industry to have a clear demand and signal from DoD. For example, Secretary Lord stated, "If you do not have a clear demand cycle and you do not know what is being purchased over the next 5 years, you cannot invest your resources, whether that be you plant, your equipment, your tooling, your people, in something where you do not know where the return is. And because there has been such an erratic demand cycle and purchasing cycle, companies start to go out of business or they put themselves up for sale. So the most critical thing that the government could do is be very clear about how much of what is going to be procured over multiple years and then have long-term multiyear contracts." And then Mr. Berteau reinforced this key message by saying, "In order to be successful, the company has to predict what DoD is going to need. They have to invest in that years in advance, and then they have to maintain that investment until such time as the contract is awarded. This is very lengthy."

I am from Long Island. Northrup Grumman used to have a big footprint. They left Long Island but a lot of their subcontractors are still on Long Island and I have met with a bunch of them. They run through an organization called the DAPS. It is an aerospace and defense trade association. And all of them have said the same thing as what these two witnesses said, they need more clarity in what kind of money is being spent and what is going to happen.

And it is not just limited to procurement though, either. It is also, as you heard from, you know, research and development. What could the federal government, in particular DoD, do to send a clear demand signal to industry regarding its priorities for aviation systems sustainment to enable greater involvement in innovation and workforce development?

Mr. FANNING. Thank you for that question. And I agree completely with what David Berteau and Ellen Lord said. Having spent most of my life on the government side in the Pentagon, now working with industry, I see how industry has to guess oftentimes. Not only is the clarity not there all the time but the consistency is not there. And so the 5-year defense program provides some clarity but is not always consistent over those 5 years. And one key element that is missing from that is sustainment costs. Seventy

percent of the lifecycle costs of what the Pentagon guys are actually in the sustainment of it. That is not included in the 5-year defense plan and that would be another element that would be very helpful for industry in its planning to take some of the guesswork out which would actually serve the Department of Defense better in the long run as well.

Mr. GARBARINO. I appreciate that.

Ms. Mackey, do you have anything to add about what the federal government and DoD can do?

Ms. MACKEY. So I would just add that the reality, the picture from a small business owner and from my colleagues at NDIA, and that is in plain speak, our bottoms are closer to the bottom line. We do not need it be easier but we need it to be consistent. So all of the strategic advice that you just gave, as well as once you release a procurement, make sure that you stay consistent to how you said you wanted to acquire. We have businesses inside NDIA right now that are working issues of having invested in order to do some of these larger procurements that really take them to the next level and then the playing field changes at the last minute and the ability to absorb those fits and starts and changes is really hard for small business. So I think consistency is the piece that I would like to recommend from the small business perspective.

Mr. GARBARINO. Yeah, the bigger businesses might be able to manage it better than the small businesses. I have heard that as well from the member companies in my district.

And just quickly, I know I am running out of time soon, a couple of you all spoke about what your company or your member companies are doing for recruitment because workforce has been very tough to fill. And I know what community colleges are doing. There has been a big push to get community colleges involved. Are we seeing any resistance from high schools, or really specifically high schools from pushing people into these trade jobs instead of pushing them to colleges or have you seen high schools being willing to send people to be part of these programs, students? And that is for anybody who has experience.

Mr. FANNING. I do not know that we are seeing resistance but I do know we need to do a better job of explaining to schools, and to parents, why these are good paths. These are high-paying jobs that can support families and are doing interesting things. And so I think that is one thing we have identified we need to do better at which is explain why these paths are good paths.

Mr. GARBARINO. All right. Thank you so much. I have run out of time so I yield back. Thank you, Mr. Chairman.

Chairman CROW. Thank you. The gentleman yields back.

One of the things that this Committee does a lot is talk about the supply of pilots, which is essential to making a lot of this work. And as additional background and context on that issue I want to submit a paper into the record with substantially more background by the Airline Pilots Association to make sure that we are getting the pilots' perspective on training and supply pilots as well.

So thank you again to our witnesses for testifying today. This hearing has showcased the importance of the aerospace industry to our nation. The pandemic created unprecedented challenges but today the sector is on its way to recovery. However, these labor

shortages will continue to hold back this industry and the entire economy if they persist. So I am hopeful we can work together to advance workforce development solutions that help upskill workers and ensure that small businesses of all types can find the right employees.

Without objection, Members have 5 legislative days to submit statements and supporting materials for the record.

And I want to just thank again all of the witnesses for your perspective, and this is the type of stuff that is actually called legislating and getting things done. And this is one of the more bipartisan committees in Congress, and I look forward to working with all Members to actually get these things done.

So if there is no further business to come before the Committee, without objection, we are adjourned. Thank you.

[Whereupon, at 11:09 a.m., the subcommittee was adjourned.]

APPENDIX

AIA Written Testimony – Final – 5.10.2022

Eric Fanning
President and Chief Executive Officer
The Aerospace Industries Association
House Small Business Subcommittee on Innovation,
Entrepreneurship, and Workforce Development

"Moving Upwards and Onwards: The Workforce and Innovation Needs
of the Aviation and Aerospace Industry."
Thursday, May 12, 2022

Introduction

Chairman Crow, Ranking Member Kim, and members of the committee, thank you for inviting me to appear before the Innovation, Entrepreneurship, and Workforce Subcommittee today. My name is Eric Fanning, and I serve as the President and CEO of the Aerospace Industries Association (AIA). For over 100 years, AIA has advocated for America's aerospace and defense (A&D) companies and the more than two million men and women who are the backbone of our industry. AIA serves as a bipartisan convener, bringing people together to find consensus on important topics, like effective federal investments and adaptation of policies that enhance our workforce's skills, diversity, and global competitiveness, empowering our industry and country for the 21st century and beyond.

AIA applauds this committee for its ongoing leadership in listening and learning from A&D industry leaders to act on new and innovative approaches to support and strengthen our industry. An essential part of this effort is rightfully focused on our world-class workforce, which brings unparalleled experience and expertise, as well as tremendous heart, to their work on behalf of America's military and our aviation transportation system.

Addressing the 21st Century workforce needs of the aviation and aerospace industry is vital to our missions, our customers, and our national and economic security. There are several ways AIA would like to work with government leaders and Congress to address these needs. This includes investing in STEM education, reskilling current industry employees for new technologies, enhancing our country's training efforts to expand talent pools, and increasing diversity and expanding equity and inclusion efforts within the A&D workforce.

Who We Are

Today, AIA represents over 300 A&D companies ranging from family-run businesses to multi-national corporations. Our membership includes aircraft and engine manufacturers, and companies that design and build cutting-edge military and dual-use-technology second to none. Our members have a worldwide reputation of global technological leadership, and the A&D

industry represents a dynamic workforce composed of many types of workers. These workers span a wide range of skill sets, from skilled trade technicians to space scientists, engineers to accountants, with many becoming more digitally focused. These jobs not only provide higher than average compensation, but also support their communities and a positive balance of trade for our nation. In 2019, the A&D industry workforce contributed $17.6 billion in state and local tax revenues and $46 billion in federal tax revenue.

Small businesses are the lifeblood of our industry. Using just one example, the Boeing Company's supplier network includes 12,000 active suppliers, with more than 6,000 of those being small and diverse businesses. Out of those numbers, approximately 600 are veteran-owned and approximately 850 are women-owned.

The Challenges We Face

The A&D workforce remains the bedrock of our industry's success. At over 2 million strong in 2020, A&D workers represented 1.4% of America's total workforce. Like so many sectors in the U.S., however, the COVID-19 pandemic reshaped our workforce and created unprecedented financial and human resources challenges, impacting the way our companies operate and the lives of our millions of employees and their families.

In 2020 alone, decreasing demand for products (due largely to the reduction in air travel) cost our industry 87,000 jobs, with our workforce shrinking by about 4%. Approximately 64% of these job losses came from the shared aerospace and defense supply chain, comprising thousands of small and medium-sized businesses that provide vital products like bolts, wiring, hoses, and electronics. While the pandemic is receding, our companies and workforce are now faced with historic inflation, which is the cost of personnel, goods, and services. Navigating these dual economic challenges is especially difficult for our small and medium-sized businesses, which identify these factors as a threat to their employee base.

The aging of the aerospace and defense workforce is also a major challenge for our industry. In AIA's most recent workforce survey fielded in 2021, we examined workforce age distribution. This survey found that the percentage of employees over the age of 55 has decreased, albeit gradually, from around 29% to about 26%. This percentage of employees over age 55 is slightly higher when compared to the total U.S. workforce, at 24%. Given this disparity and a projected increase in retirements (some of which were accelerated by the pandemic), it will be imperative to retain and develop the mid-career workforce, while also continuing to attract top talent across the workforce to confirm that A&D companies have employees with the skills needed for future success.

Tapping into the ingenuity, experience, and expertise of diverse teams helped the A&D industry send Americans to the Moon and back, helped protect our country through two world wars, and developed incredible technology like GPS. AIA and our members are committed to strengthening the diversity, equity, and inclusion (DEI) throughout our industry. We do recognize that this is not a problem we can fix by just focusing on our industry alone. Working

across industries is essential to achieving our goal of inclusivity and have access to the best workforce this country has to offer.

What We Have Learned

In Fall 2021, AIA and the American Institute of Aeronautics and Astronautics (AIAA) released their 2021 Aerospace & Defense Workforce Study, conducted in collaboration with Ernst & Young LLP (EY US). The report, which includes analysis from 33 companies representing over 950,000 employees across the globe, outlines efforts in workforce development and diversity, as well as areas of opportunity in which additional progress can be made. Concentrating its analysis on five key topics (reframing the future of work; winning the competition for talent; workforce demographic data; diversity, equity and inclusion; and the future of the workforce), this study underscored the industry's approach of using data-driven insights for workforce planning and the industry's overall commitment to data transparency and talent analytics.

The 2021 Workforce Study analyzed current efforts across the A&D industry and outlined a roadmap for future work and industry growth, including the following key insights:

- Positive Trends in Employee Demographics – Although the A&D workforce is less diverse than the overall U.S. labor force, year-over-year trends indicate various key metrics are moving in a positive direction. For example, the representation of women and Black employees at the executive level has increased consistently for the past several years.

- Innovative Recruiting Efforts to Increase Diversity in Talent Pipelines – Our companies are investing significant resources into the attraction and recruitment of diverse candidates. From new partnerships with Minority-Serving Institutions (MSIs) to intentional promotion and succession plans that prioritize equity and inclusion, companies are working to address DEI at all levels of business.

- Reimagining the Future of Work – The 2021 Workforce Study captured employee sentiment around the nature of work and its impact on employee experience. While COVID-19 reinforced A&D as a critical industry, it also created opportunities for the industry to increase flexibility and offer new solutions for its workforce to increase employee satisfaction, engagement, and belonging.

What Can This Committee Do?

To remain a global technology leader, both industry and government need to put more investment into the search for competitive talent to join the A&D industry. That means looking for non-traditional sources to increase the talent pool, streamlining our processes for attracting and retaining talent, and building our future workforce at earlier stages. As we develop the next generation of world-changing innovations, from autonomous flight to sending humans to Mars, our industry must build on our work to include diverse voices and perspectives at the idea phase, in the board room, and everywhere in between. This committee should evaluate the following policy options:

Congress should expand federal support for apprenticeships and career technical education. There are several programs created at the state and local levels which the Department of Labor (DoL) should consider scaling for the benefit of critical industries, like the A&D industry. These programs expand career pathways for high school graduates alternative to pursuing post-secondary education, as well as opportunities for career transitions. One example of the success of these programs comes from an AIA member, Certified Aviation Services (CAS). CAS launched a unique aviation apprenticeship program at Valley Community College in San Bernardino, California. There, students work on various commercial aircraft projects from sheet metal to building avionic technology and other necessary technical training skills needed to attain an Airframe and Powerplant (A&P) mechanics license. These students also delve into routine and non-routine maintenance on a wide variety of commercial aircraft including 737, 757, and 787 planes. This apprenticeship program allows community college students to develop and grow into high salary careers in the world of large aircraft projects while CAS develops a continuous pipeline of prospective future employees. The success of CAS' innovative program so far allowed them to start expanding the program to community colleges in Alabama and Nevada. With the help of additional federal and state support, successful programs like this one could continue to expand nationwide, creating a diverse next generation talent for the A&D industry.

Congress should explore the establishment of a program where activities conducted by contractors to support STEM education be considered as allowable community service activities for the purposes of determining allowability of cost on a government contract. A great example of such an activity comes from AIA member BAE Systems. BAE partnered with MY TURN, a non-profit organization in New Hampshire that is helping underrepresented youth launch careers in advanced manufacturing through financial assistance, career coaching, and support services. Since the creation of the partnership, more than 40 MY TURN participants have graduated from the Microelectronics Boot Camp at Nashua Community College, a ten-week course that prepares students for entry-level advanced manufacturing roles. Together, these powerful partnerships are making a difference for our business and our community, not only opening doors to meaningful employment opportunities, but also changing lives by developing high caliber, motivated talent in our local communities.

While significant progress has been made in past couple of years, ensuring that employees can obtain security clearances in a timely manner remains a persistent challenge and puts the DIB at a competitive disadvantage in the competition for top talent. Security clearance processing is a historically slow and bureaucratic process, which leads to staffing delays and slowdowns for important national security projects for both industry and our government partners. AIA members know well that the current process to get a security clearance for a new hire can take as long as eighteen months. This causes lengthy delays in project development for current and future defense articles. Additionally, reciprocity, and reinstatement requirements play a large role in these problems, and there are common-sense measures Congress could take to remedy them. Military veterans and DoD civilians are two groups often in the waiting line for clearance

processing, while also often having existing favorably adjudicated clearances. Reforms should be considered to allow these groups to be exempt from certain reciprocity processes when seeking post-service employment.

Congress should also make efforts to reform the Federal Work-Study Program to reach more students from low-income backgrounds, particularly those at community colleges, historically black colleges and universities (HBCUs), Hispanic-serving institutions (HSIs), and other minority-serving institutions (MSIs). These reforms should include helping students access on- and off-campus work experiences that align with their career path. Improving the overall recruitment and applicant pool of underrepresented minorities applying for government research programs, a process that should include investigating the reason many underrepresented students drop out during the application process and piloting a mentoring effort to increase application success.

Another way Congress can provide immediate help to the A&D industry workforce is by improving access and annual funding for the Federal Aviation Administration (FAA) aviation workforce development grant programs. Funding for current FAA aviation workforce development grant programs does not meet the level of expressed interest the A&D industry has demonstrated in the application processes. The current program was authorized by Congress in Section 625 of the 2018 FAA Reauthorization Act. Congress should increase annual funding for the grant program, as well as expand access for aviation manufacturers beyond pilot and aircraft maintenance training, to ensure America's global leadership in A&D and the ability of the industry's workforce to adapt to new technological environments and develop innovative skills.

Congress should expand current government-industry exchange programs. The relationship between the DoD Acquisition workforce and private-sector acquisition professionals is a critical element of the defense acquisition system. This need is even more pronounced when DOD places reliance on centralized 'cadres' of experts (e.g., the Defense Contract Management Agency's Commercial Items Group (CIG), or various Intellectual Property cadres across DOD) that impact the breadth of DOD acquisitions.

Finally, Congress must address a harmful tax change that went into effect in January 2022 and has significantly impacted America's innovators, in all sectors of our economy, because companies are no longer able to immediately write-off the full value of their investments in R&D. With less private investment in R&D, we risk our workforce lagging behind in the high-tech skills and the expertise to maintain our competitive edge. At a time when we need to stay ahead of the growing competitive threat from China, we must continue to build our world-class A&D workforce, not jeopardize high-paying American jobs at businesses of all sizes while simultaneously constraining domestic investment in strategically critical technologies.

Thank you, and I look forward to your questions.

STATEMENT OF

ML MACKEY

CEO, BEACON INTERACTIVE SYSTEMS

CHAIR, SMALL BUSINESS DIVISION,

NATIONAL DEFENSE INDUSTRIAL ASSOCIATION (NDIA)

BEFORE THE

COMMITTEE ON SMALL BUSINESS SUBCOMMITTEE ON INNOVATION,

ENTREPRENEURSHIP, AND WORKFORCE DEVELOPMENT

ON

"MOVING UPWARDS AND ONWARDS: THE WORKFORCE AND INNOVATION

NEEDS OF THE AVIATION AND AEROSPACE INDUSTRY"

12 MAY 2022

NOT PUBLIC UNTIL RELEASED BY THE
HOUSE COMMITTEE ON SMALL BUSINESS

Introduction
Chairman Crow, Ranking Member Kim, and Members of the Committee, thank you for inviting me to appear before the Innovation, Entrepreneurship, and Workforce Subcommittee today, and thank you for your consistent efforts in supporting America's small business community.

My name is ML Mackey, and I am the CEO of Beacon Interactive Systems. Beacon delivers innovative, efficiency improving, digital capabilities to the U.S. Air Force. I am also here today in my role as the Chair of the Small Business Division of the National Defense Industrial Association (NDIA), the nation's oldest and largest defense industry association, comprised of nearly 1,800 corporate and over 63,000 individual members.

The challenge facing the Aviation & Aerospace Industry today is a workforce challenge. How do we increasingly grow the innovation workforce to address both current and future needs? Whether it is a focus on the scientists and engineers developing and delivering innovative technology or the maintenance technicians, the Airmen on the flight line, maintaining and sustaining aircraft, there is a workforce shortage across the board.

To be successful we can either increase the workforce so that we have more people available, or we can increase the capacity of the resources in place. The most successful outcome will be an artful combination of the two.

Using Beacon as an example, participating in Federal R&D Programs not only enabled us to further develop technology innovation for the maintainers on the flight line, it also enabled us to further develop our own innovation workforce. This developmental impact in terms of becoming an ever more innovative team is the multiplier effect of Federal R&D funding.

It is important to call out that the Innovation Workforce is not only comprised of the technical resources typically thought of in STEM discussions but also the wider team of innovative thinkers necessary to bring a successful product forward. It includes the Program Managers, the Analysts, and the extended teammates of our Air Force colleagues on the flight line. This is the diversity of thought and creativity that fuels successful innovation. This is the team Federal R&D funds let us explore, find, and push the envelope to develop.

Without this well-developed intentional diversity of thought, innovation happens in one-off moments not as the continuous engine critical to U.S. National Security needs and the country's economic prosperity.

At this point I would like to broaden the discussion to bring in input and recommendations from my fellow NDIA colleagues.

Workforce Training
The success and growth of the Aerospace & Defense industry is reliant on a robust and talented workforce. Technicians are a critical component to the overall operational safety of the industry and are playing a vital role in supporting the pandemic recovery efforts.

Boeing's recently released Pilot and Technician Outlook 2021–2040 forecasted that 626,000 new maintenance technicians will be needed to meet operator and MRO demand to maintain the global commercial aviation fleet over the next 20 years. Maintenance technicians will play a critical role in restoring, inspecting, and preparing aircraft that have sat idle during the pandemic to meet airworthiness standards. As importantly the industry will need an influx of technicians familiar with electrical and hybrid motors and components to keep pace with the emerging Advanced Air Mobility sector.

The recommendation here is to both continue and accelerate investment in Federal Workforce Training Programs for upskilling of the existing workforce as well as outreach efforts for future workforce development.

Procurement Visibility
The need for a clear demand signal from the federal government, while important across all industry participants, is especially true for Small Business. This isn't limited to just to Procurement or Research & Development, it's also needed for businesses providing aerospace services, spare parts, and support.

A critical step the Federal Government, and particularly DoD, could take to send a clearer demand signal to industry regarding its priorities for aerospace systems' sustainment would be to provide additional detail in the Operation & Maintenance Budget Request regarding the materiel availability objective for each major weapon system and the resources required, across the FYDP, to achieve that objective.

That kind of accountability and transparency on the part of the federal government would enable greater investment in innovation and workforce development.

In closing, I'll give voice to a third recommendation which is more about how to think about Federal R&D than actual steps to take. I am going to suggest we collectively adjust our thinking on R&D funding from a singular engagement to more of a continuum. That it should be viewed as more than just the specific outcome of the specific R&D funding. It should be understood as a continuous investment in developing the innovation workforce critical to the Aviation and Aerospace Industry.

Conclusion
With that, I will close my remarks. Again, I'd like to thank you Chairman Crow, Ranking Member Kim, and Members of the Committee. Thank you for the opportunity to appear before you this morning and thank you for your continued efforts in helping the small business community.

I would be pleased to respond to any of your questions.

BOOM

Testimony before the
House of Representatives Committee on Small Business
Subcommittee on Innovation, Entrepreneurship, and Workforce Development
Moving Upwards and Onwards:
The Workforce and Innovation Needs of the Aviation and Aerospace Industry

Blake Scholl, CEO & Founder
Boom Supersonic
May 12, 2022

Introduction

Good morning, Chair Crow, Ranking Member Kim, and Members of the Subcommittee.

My name is Blake Scholl, Founder and CEO of Boom Supersonic. Thank you for inviting me to testify before you on entrepreneurship; the importance of innovation and workforce development in U.S. aerospace; and our efforts to ensure the safe, sustainable reintroduction of commercial supersonic air travel.

At Boom, we believe in a world where more people can go to more places more often. Today, the barriers of time and inconvenience limit us from experiencing much of what the world has to offer. By building transportation that is faster, more convenient, and more sustainable, we can unlock new possibilities to connect with one another.

Boom is redefining long-distance travel beginning with Overture, our supersonic commercial airplane. We are developing Overture to satisfy three top-line objectives: speed, safety, and sustainability. Aboard Overture, London would be just 3.5 hours from New York, and Sydney becomes as accessible as Honolulu is today. Ultimately, we envision a future in which anyone can buy a ticket and enjoy the benefits of high-speed travel. Speed powers growth and transformation, and increasing the speed of travel would foster greater human connection.

Until the middle of the twentieth century, people could expect continued improvements in travel speeds. Railroads, steamships, piston-powered airliners, and jets each represented a step change in how we got around. In the 1960s, at the dawn of the jet age, it seemed that supersonic aviation was right around the corner—Concorde took flight only ten years after Pan Am took delivery of the first 707. But while a technological marvel in its time, Concorde was loud, costly, and fuel hungry.

The idea of supersonic commercial travel was perhaps ahead of its time in the 1960s, as the technology for economically and environmentally sustainable supersonic flight



did not yet exist. And as a result, we are flying no faster in 2022 than we were in 1960. The world has now gone more than sixty years without a meaningful improvement in the speed of long-distance travel. But today, thanks to fundamental advancements in the aviation industry and key breakthroughs at Boom, supersonic flight will be more comfortable, more affordable, more sustainable, and safe.

We are seeing interest in faster travel across the globe. In the context of global airline customers, we see this as a positive, because we want everybody to have access to speed. But in the manufacturing context—on the question of which country gets to claim leadership in next-generation passenger aircraft—we need to be more wary. It is important to note that the United States is not the only country pursuing new supersonic aircraft development—China and Russia are also very publicly investing in this field. The promise of this sizable commercial market and potential military advantages will spur international competition, and the United States must remain in the lead.

Innovation

Powering these advancements is a revolution in energy, which is unlocking a host of amazing new products—electric cars, air taxis, supersonic jets. In history, every revolution in energy has brought along diverse benefits, including in the speed of travel. In the nineteenth century, coal powered the transition from sail to steam and horse to railroad. In the first half of the twentieth century, oil powered the transition to airplanes. And this decade, alternative fuels will power the transition to sustainable supersonic flight.

We are entering a new era of sustainable energy production, and Overture is a new supersonic airliner built for this future. Overture will be capable of running on 100% sustainable aviation fuels, facilitating net-zero carbon flights. Sustainable aviation fuel will ensure enduring U.S. energy independence—and we need continued leadership from Congress and the White House to adopt policies and incentives that allow domestic producers to meet our aviation sector's demand using our waste materials, agricultural waste, or carbon dioxide from the air.

Beyond net-zero carbon fuels, Overture will leverage state-of-the-art computational design methods, advanced composite materials, innovative clean and quiet propulsion concepts, and modern turbofan engines. These technologies represent sixty years of advancement, but supersonic commercial aviation is still in its early days. Over time, we expect continued investment and innovation to lead to supersonic airliners that are even more efficient and less expensive to operate. This progress will lower ticket prices, reduce fuel burn and emissions, and ultimately make high speed flight available to all passengers.



While incremental innovation happens continuously in this industry, it takes new entrants like Boom to change the fundamental paradigm of travel—both in terms of speed and sustainability. Boom has built a culture that values step-change innovation, and we have assembled leaders and engineering talent from across the aviation sector. Combining this foundation with our mission-aligned customers, suppliers, partners, and investors helps us innovate faster than the incumbents.

Speed, Safety & Sustainability

At Boom, we are guided by three pillars: speed, safety, and sustainability. It is only thanks to continued innovation—the focus of this hearing—that we are able to develop a new supersonic airliner that satisfies all three imperatives.

Safety

At Boom, we have worked diligently since day one to build a strong safety culture and incorporate safety technology systems. The U.S. aviation industry has an exceptional safety record, and commercial aviation is by far the safest mode of transportation. We are committed to build on that legacy. We have been proactively developing a safety management system and incorporating lessons learned and best practices to ensure Overture is designed and built with multi-layered safety in mind at every step.

Sustainability

Sustainability is embedded into every facet of Boom's aircraft program, and Boom is transforming aviation by accelerating the advancement of these technologies—we believe the fastest flight should also be sustainable.

Aviation faces two primary environmental challenges—noise and emissions—and the team at Boom is diligently working to optimize efficiency and sound levels in the aircraft design. Overture will meet the same stringent noise levels set for subsonic jets through the use of innovative new technologies. Overture will blend into existing soundscapes, and because of the benefit of speed, airlines may be able to reduce operations during sensitive nighttime hours. Because Overture will fly at supersonic speeds only over water, the aircraft will not create sonic booms over communities. To address communities' concerns about Overture's impact, we plan to engage with airports and stakeholders well ahead of Overture's entry into service to understand and address their concerns. We also want to highlight the societal and economic benefits that Overture will bring to communities and have our neighbors share our excitement to bring back supersonic commercial air service.

Regarding emissions, net zero carbon operation is at the core of our commitment to preserving the earth's climate. Beginning in 2021, Boom achieved a major milestone on this mission by achieving carbon neutrality across our company. Looking forward, Overture will operate on up to 100% sustainable aviation fuels (SAF), a key strategy

for sustainable long-haul aviation. We have committed to achieving net zero carbon emissions by 2025—in just three years—well ahead of industry and government targets.

U.S. global leadership in aviation

The U.S. has long been the global leader in aerospace, and at Boom we are determined to see the U.S. be the first to introduce sustainable supersonic travel. U.S. airlines have shown early interest in Overture. Last year, Boom and United Airlines announced a commercial agreement for United to purchase fifteen Overture airliners, with an option for an additional thirty-five more. The United agreement brings Overture's orders and pre-orders to seventy aircraft—by comparison, only fourteen Concordes ever saw commercial service.

To ensure that U.S. leadership endures and we remain ahead of our competitors, the federal government must continue to nurture innovation and encourage those companies and innovators building the next generation of aerospace technology.

Benefits to the U.S. Military and Defense Industrial Base

New supersonic aircraft technology developed at Boom and in the supply base will not only have broad commercial benefits—it will also provide valuable new strategic options to the U.S. military. Overture would give the US military the ability to move people and cargo anywhere in the world in half the time. We cannot underestimate the political and military advantages that accompany this speedup.

Recent geopolitical events have shown that our security concerns can escalate at any moment. There is a major conflict at the gates of NATO, and the U.S. must continue to strengthen its homegrown industrial capacity. Fostering an industry around high-speed aircraft manufacturing would be transformative for the U.S. government and armed forces.

For the United States government, supersonic travel represents a significant expansion in people movement capabilities: conveying leaders across the world in half the time to resolve crises and build international connections; evacuating wounded soldiers to medical care in time to save lives.

In addition, transporting critical cargo is another compelling use case for large supersonic aircraft. A derivative of Overture could offer the Air Force a future strategic capability in rapid global transport and logistics—such as rapidly carrying life saving emergency supplies and communications equipment where they are needed.



Small Business Innovation Research (SBIR)

The Small Business Innovation Research (SBIR) is an important program for new entrants such as Boom, enabling cooperation with the government at the beginning of the process to accommodate potential military needs and advance aviation technology before these technologies are ready to be a program of record. Without SBIR and early investment by DOD, some of these technologies would never mature.

Boom is proud to have two Small Business Innovation Research (SBIR) contracts with the Air Force. Our first SBIR contract was awarded in 2020—we received a $2M contract to explore how Overture's interior could be adapted for military purposes. Our most recent SBIR contract is a three-year strategic cost-share partnership between the Air Force and Boom to accelerate research and development on Overture. Nominally, this partnership is a $30 million/$30 million match between the Air Force and Boom, but the Air Force is in fact leveraging the much larger amount of private capital that Boom has raised.

This lever is a critical benefit of programs like SBIR and STRATFI—in our case, this partnership allows the AAir Force to leverage our private funds by 10 to 1, reducing the development costs for defense applications of supersonic technology. We are proud that the Air Force is interested in the advantages Overture offers, leveraging our R&D investments.

Through STRATFI, Boom is working directly with the Program Executive Officer, who is generally focused on growing capabilities, beyond R&D. The Air Force's interest in our work sends a powerful signal to our investors and partners, enhancing the commercial viability of our aircraft and helping propel a flywheel of progress.

Recognizing that a strong U.S. defense industrial base is critical for our country in any conflict, a key benefit of this partnership is to expand and diversify the industrial base—fostering competition, improving resilience, and increasing optionality for defense procurement. Through SBIR, the Air Force established AFWERX, an innovation arm that supports programs such as STRATFI (Strategic Funding Increase). This important program lets the Air Force leverage capital-intensive technology projects focused on advanced capabilities like supersonic aviation.

The SBIR program is also consistent with the Department of Defense February 2022 report on the State of Competition within the Defense Industrial Base. Competition is vital to the defense industrial base. DoD made 5 recommendations including:

- *Increasing New Entrants* to "counteract the trend of overall shrinking of the DIB" and;
- *Increasing Opportunities for Small Businesses* "in defense procurement, with an emphasis on increasing competition in priority industrial base sectors.



Workforce

One critical lesson we learned through the pandemic is the importance of domestic manufacturing and our supply chain. Boom is proud to be a part of a renaissance in U.S. manufacturing. We are proud that the supersonic future will be built here in the United States, leveraging the formidable talent, entrepreneurial spirit, and tradition of innovation in our workforce. Through this decade as we bring Overture to market, we will create thousands of manufacturing jobs—jobs that will enable more families to realize the promises of life in our country.

As commercial aviation enters this new era of faster travel, Boom is committed to investing in the next generation of engineering and manufacturing workers. America's aerospace workforce is unmatched in capability and quality, and we intend to inspire future generations to continue this progress.

Colorado: HQ, Engineering

Since 2014, Boom has been headquartered in the Denver Metro area of Colorado, and we have benefited immensely from the local talent ecosystem. We currently have 195 full-time employees. We continue to grow our Colorado workforce, which we expect to surpass 500 employees in the next 2–3 years.

North Carolina: Manufacturing

Recently, Boom also announced a significant expansion in Greensboro, North Carolina, where we will build our LEED certified Overture Superfactory to manufacture our first commercial airliner. We chose North Carolina after an extensive, nation-wide search for a strong talent pool, network of four-year colleges and technical schools, and proximity to the ocean for supersonic flight testing.

COVID impacts

While the pandemic significantly disrupted the aviation industry—and commercial travel has not yet fully rebounded—Boom has continued to progress through our development program. Since March 2020, the start of the pandemic, we have hired seventy full-time employees, and we were able to continue company expansion without relying on any federal financial assistance (e.g., Payroll Support Program). Because our company continued to operate and grow during this difficult time, we were able to maintain business relationships in the supply chain, providing some certainty to our aviation suppliers.

Talent

Since the beginning of the 21st century, innovation in aviation has dramatically increased bringing about drones, advanced air mobility, commercial space access and the return of supersonic travel. Advancements in technology, increasing interest from investors, and expanded government partnerships have all enabled such a positive



growth trajectory. In order to continue such growth, we have to continue to develop and attract the next generation of skilled, qualified workers. We are especially concerned with developing the right skills in future engineers and technicians who are entering the job market.

Boom has encountered challenges attracting and retaining high-quality talent, and we recognize this issue will grow as our company scales. In North Carolina, we plan to create over 2400 jobs over the next decade. In order to prepare the local workforce for this opportunity, we are performing outreach to technical colleges and 4-year programs to develop programs teaching the requisite skills for jobs in supersonic manufacturing.

Beginning in 2023, as part of our Emerging Talent program, we will launch an internship and apprenticeship program at our production facility in North Carolina—specifically for students who attend university, community college, and/or technical school in North Carolina. We are designing experiential learning programs that include custom onboarding, lunch-and-learn sessions, and a performance feedback system. Over the next ten years, we plan to create more than 200 of these opportunities.

How Congress Can Continue to Assist Small, Innovative Aviation Companies

The government plays an important role in ensuring that small businesses have the opportunity to compete and thrive. Government public-private partnerships like SBIR help small businesses grow, spurring economic growth, fostering competition and expanding the defense industrial base.

Investments in Sustainable Energy

Another successful mechanism that is advancing sustainable aviation innovation is the Federal Aviation Administration's (FAA) Continuous Lower Energy, Emissions and Noise (CLEEN) cost-share program. CLEEN has been a successful public-private partnership to help advance sustainable technologies and fuels. We would like to see this program awarded to more new entrants, helping small businesses innovate on critical technologies.

In order to fly in an increasingly more sustainable way, investments to commercialize SAF are critical. The SAF industry remains nascent, and is largely composed of small and medium enterprises. This burgeoning industry is critical to decarbonizing aviation. A number of government policy incentives would greatly benefit these emerging companies, including a SAF blenders tax credit and grants or loans for building the infrastructure required to scale SAF production.



Regulatory Certainty

Timely and effective regulation is critical to our success in certification and consequently bringing Overture to market. The FAA has also shown great leadership both domestically and at the International Civil Aviation Organization promoting the global standards necessary to develop, certify, and operate supersonic aircraft. Congressional support is essential to ensure this leadership continues.

SBIR

And finally, programs such as the Small Business Innovation Research (SBIR) are an excellent example of how the government can assist small businesses and how new companies like Boom can contribute to defense priorities while accelerating technological progress. As this powerful new sector emerges, maintaining a lead in supersonic aviation is vital for the future competitiveness of the U.S. military. Our supersonic program, starting with the Overture aircraft, will have second-order impacts in strengthening the U.S. defense industrial base. Through the SBIR program, the government can engage early to leverage and support continued U.S. innovation.

Conclusion

Thank you for having me here today, and I am happy to answer any questions.

Judy Burns
President
Patriot Machine, Inc.

Testimony before the U.S. House Committee on Small Business
Subcommittee on Innovation, Entrepreneurship,
and Workforce Development

Hearing Title:

"Moving Upwards and Onwards: The Workforce and
Innovation Needs of the Aviation and Aerospace Industry"

May 12, 2022

Via Zoom

Patriot Machine, Inc.
76 South Corporate Hills Drive
St. Charles, MO 63301

Introduction

Chairman Jason Crow, Ranking Member Young Kim, and other distinguished members of the Subcommittee, thank you for the opportunity to testify in this hearing about the workforce and innovation needs of the aviation and aerospace industry. I appreciate the opportunities that allow small businesses to participate in the aerospace and defense industry.

I am the president and co-founder of Patriot Machine. Over the past 31 years, my company has grown from my home's garage into a globally competitive aerospace manufacturer with 160 employees. Headquartered in St. Charles, Missouri, we supply a variety of highly complex structural parts and assemblies to America's largest aircraft manufacturers. From the beginning, innovation has been the key to thriving in a highly competitive environment. The long-term health of our company depends on regularly integrating new technologies and continually finding new and better ways to improve operations. While we pride ourselves on our culture of continuous improvement and problem-solving, there are some challenges I feel we cannot take on alone.

Labor Shortages and Workforce Development

The labor shortage in America affects all businesses. At Patriot Machine, we have seen a marked decline in the number of skilled applicants since early 2020. Increasingly we are training new hires on the job because they come to us without the necessary manufacturing skills. We also encourage our employees to further their education through financial aid for schooling, as well as internal development programs that emphasize structured on-the-job training and mentorship. The costs of recruiting, onboarding and training new hires are significant, particularly if those employees leave the company after a short period of employment. We know employees are looking for opportunities to learn and

grow and we are committed to helping them. This is why we would like to see an increase in federal funding for technical education and community college programs with a technical focus to help prepare the incoming workforce for careers in aerospace manufacturing.

Supply Chain and Rising Costs

Meanwhile, the aerospace industry's supply chain disruptions and rising prices in our sector have only worsened in the perfect storm of recent events. The price and lead-time of raw materials has doubled. Labor force issues, rising costs and other factors have caused our suppliers to increase their pricing significantly. Yet even under these volatile conditions, Patriot is bound by long-term fixed price contracts with our customers.

I encourage you to keep these challenges in mind when making decisions on the 2023 defense budget. The increase currently outlined, while helpful, does not provide significant growth due to inflation. Aerospace companies like ours depend on strong support for existing production programs, in addition to advanced development programs.

Incentivizing Innovation

Lastly, we are a capital-intensive business with a need to make serious financial investments in assets that often do not pay off for years. This is especially true of the acquisition of our high-tech machinery and equipment, which can take several years between the initial purchase, manufacture and installation. Hiring, training and retaining individuals capable of programming and operating this equipment takes significant investment as well. One item which helped manage these high-cost hurdles was the Tax Cuts and Jobs Act of 2017, which temporarily increased the allowance of bonus depreciation to qualified property to 100% of the value of assets acquired that year. However, that

percentage will be phased out by 2027. An extension of these benefits, and perhaps even a way of making these benefits permanent and known in advance, would help Patriot Machine and other small businesses plan for the future.

Conclusion

Thank you again for letting me share my perspective as a small business owner in the aerospace manufacturing industry. Your investments in aerospace projects allow us to continually improve technologies and develop the next generation of the workforce and industry leaders.

NBAA

STATEMENT FOR THE RECORD
Ed Bolen, President & CEO
National Business Aviation Association

SUBMITTED TO THE

House Committee on Small Business
Subcommittee on Innovation, Entrepreneurship, and Workforce Development

Hearing:
"Moving Upwards and Onwards: The Workforce and Innovation Needs of the Aviation and Aerospace Industry"

May 12, 2022

Chairman Crow, Ranking Member Kim, and members of the Subcommittee on Innovation, Entrepreneurship and Workforce Development, thank you for holding this hearing to address the Workforce and Innovation Needs of the Aviation and Aerospace Industry. On behalf of the National Business Aviation Association's (NBAA's) 11,000-member companies, we are pleased to provide this statement for the record.

NBAA's members, many of which are small businesses, rely on business aircraft to meet some portion of their transportation challenges. Business aircraft provide connectivity to communities in nearly every Congressional district, many of which are not served by commercial airlines. While the airlines serve only around 500 airports, business aviation can reach 5,000.

Business aviation is part of the general aviation industry, which includes all operations and manufacturing other than those supporting scheduled commercial air service or the military. Our industry supports nearly 1.2 million jobs and more than $240 billion in economic output. Further, the U.S. civil aviation industry is a vital part of international trade, providing a $75 billion favorable balance of trade in 2018 and was essential in vaccine and medical supply delivery during the COVID-19 pandemic.

However, for general aviation to continue growing and supporting communities, we must address the significant workforce challenges, including the growing shortage of pilots and technicians. According to pre-pandemic forecasts from the Boeing company outlook, 645,000 new commercial pilots and nearly 100,000 new business aircraft pilots will be needed worldwide between 2019 and 2038. There is a projected worldwide demand for almost 770,000 new technicians in the maintenance sector over the next 20 years.

Although the pandemic has provided a momentary reprieve from the transportation workforce shortage, the demand for qualified workers is returning and the workforce shortage will again destabilize transportation operations. The aviation industry will have a global demand for at least 34,000 pilots by 2025, with women making up only 5% of pilots and other underrepresented groups making up less than 10% of men and women.

As recovery and the worldwide demand for air travel continues to increase, we must come together and take bold actions that will enable the U.S. to maintain its role as the world leader in aviation. To help support those efforts, NBAA has taken the lead on several fronts to address workforce shortages, including working with Chairman Larsen, the late Congressman Don Young, Congresswoman Angie Craig, Senator Gary Peters, Senator Dan Sullivan, and Senator Catherine Cortez Masto on the introduction of H.R. 3310 and S. 1681, the Promoting Service in Transportation Act, which was included in The Infrastructure Investment and Jobs Act. This legislation authorizes the Department of Transportation to develop a series of broadcast, digital and print public service announcements to promote career opportunities and improve diversity in the transportation workforce.

Through these public service announcements, we will raise awareness of careers across all modes of transportation, including aviation. There will also be synergies with the President's efforts to grow the STEM workforce and related educational opportunities. While momentum around the future STEM workforce is strong, students often do not consider aircraft pilot and aviation technician careers. That is why the full funding of this program through this year's appropriations process is critical. It will help address these challenges by building linkages between STEM programs and the significant career opportunities for pilots and technicians.

We also supported the efforts of Congress to address aviation workforce issues in the FAA Reauthorization Act of 2018, which included numerous workforce development initiatives. Specifically, the bill established grant programs to support the education of future aircraft pilots and the recruitment of much-needed aviation maintenance technicians. Both programs received the full $5 million in funding through the appropriations process. The bill also enacted two aviation workforce programs, the Youth Access to American Jobs in Aviation Task Force and the Women in Aviation Advisory Board, to develop and recommend initiatives to encourage youth and women to pursue careers in aviation.

NBAA has representation on the FAA/DOT's Women in Aviation Advisory Board and the Youth Access to American Jobs in Aviation Task Force. These boards are closely aligned in its missions to attract, retain and develop aviation professionals, especially those from underrepresented communities. The Women in Aviation Advisory Board recently reported[1] its findings at its March 2022 public meeting, identifying 55 recommendations focused on culture, recruitment, retention, advancement, and data critical to ensuring the aviation industry's safety, sustainability, profitability, and ability to innovate.

The Youth Task Force will make its formal recommendations in September 2022 but is keenly focused on the value of creating a "one-stop shop" website on aviation career support for students, counselors, teachers, parents and others, as well as other initiatives to help high school students be successful in achieving aviation career goals.

NBAA is leading several significant initiatives to attract the next generation of pilots and technicians to the general aviation industry. At our largest event, NBAA-BACE, which attracts nearly 26,000 attendees, we host a "Careers in Business Aviation Day" that draws hundreds of students and provides three days of workforce development programming as part of the association's "Collegiate Connect" initiative. During our most recent event, students heard from Members of Congress on the importance and vastness of an aviation career.

Each year, we continue these efforts at NBAA's regional events and targeted educational programs by offering student-focused programming to educate young people about the many career opportunities in business aviation. Utilizing our events to introduce students to business aviation allows us to build networking opportunities and expand a dedicated mentoring program, creating valuable connections between students and industry professionals.

Some of the most qualified potential business aviation employees are our dedicated military professionals transitioning to civilian careers. These individuals often have advanced technical training and can successfully move into rewarding general aviation careers. We are currently working with Hiring Our Heroes and the U.S. Air Force to increase awareness of business aviation career opportunities among members of the military.

We are also partnering with the Red Tail Flight Academy (RFA) to address the need to build a bridge for the industry to recruit and retain from underrepresented communities. As RFA develops a diverse talent pool with cross-functional skill sets, NBAA provides opportunities for that talent to access the industry through our events, scholarships, and educational opportunities. This initiative will help to ensure that the industry remains competitive and reflects a more diverse workforce.

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[1] Women In Aviation Advisory Board, Recommendations Report "Breaking Barriers for Women In Aviation: Flight Plan for the Future" https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/WIAAB_Recommendations_Report_March_2022.pdf

NBAA standing committees and work groups are also focused on attracting, retaining, and developing aviation professionals through in-person and online education, sharing scholarship opportunities, mentor networks, and regionally-focused engagement with students of all ages. This includes highlighting DE&I best practices and using NBAA media channels to promote the "see it, be it" for students exposed to aviation careers.

Finally, through NBAA's Young Professionals in Business Aviation (YoPro) group, we are using social media to highlight the positive personal and societal impact of a career in aviation. These efforts are paying off with thousands of young people following and engaging with our YoPro Instagram and Facebook groups. We plan to leverage these social media opportunities with focused content for students in *Business Aviation Insider,* NBAA's print publication for the community.

As technological advances continue to impact the aviation industry, NBAA recognizes the need for representation among the emerging technologies communities to ensure safe and secure integration into the National Airspace Systems (NAS); as well as the recruitment and development of a workforce with diverse skill sets to service these new technologies. One way we are addressing this is through the creation of the Emerging Technology Committee and Advanced Air Mobility (AAM) Roundtable. Through meetings with this industry, NBAA identified workforce challenges facing this sector and is actively engaging Congress and government agencies to address these concerns. Our input was included in the recently released GAO Study,[2] *Stakeholders Identified Issues to Address for 'Advanced Air Mobility'*.

Through the Infrastructure Investment and Jobs Act (IIJA), Congress has already shown strong leadership in addressing aviation workforce challenges. With rapidly advancing technology, including electric aircraft, advanced air mobility, and unmanned systems, our industry is ready to grow; however, to be successful, we must all work to attract the next generation of employees. As the Subcommittee continues to bring stakeholders together in developing solutions to workforce challenges, NBAA looks forward to being part of the process and highlighting the importance of general aviation to the nation.

[2] United States Government Accountability Office (GAO), Report to Congressional Committees: Transforming Aviation: Stakeholders Identified Issues to Address for 'Advanced Air Mobility', accessed May 2022, https://www.gao.gov/assets/gao-22-105020.pdf

ALPA FACT SHEET

Pilot Supply by the Numbers

Regardless of what the airlines are saying, there is no pilot shortage and there are more than enough certificated pilots to meet demand here in the United States. The aviation industry is currently producing more pilots capable of immediately stepping into the right seat than there are jobs available to them.

However, there is a need to hold airlines accountable for the $63 billion in taxpayer subsidies they received during the pandemic, money that was designed to maintain their workforce and prepare for the economic recovery we are experiencing today. Instead, they are cutting service to small communities and trying to blame the frontline aviation workers who saved their businesses during the pandemic.

According to the FAA's *Civil Airmen Chart** (Table 17), a total of 15,591 new air transport pilot (ATP and R-ATP) licenses were issued between 2019 and 2021. During that same time, approximately 9,671 pilots retired. Simply by the numbers, there remains a surplus of approximately 6,000 pilots available to meet the needs of the airlines.

While the pandemic accelerated some early retirements at the airlines in 2020, the average yearly attrition of pilots reaching age 65 is approximately 2,500.

The average number of ATPs issued per year since 2012 is 6,500. Growth is expected, yet even if that numbers stays the same, that equates to a ***surplus of 4,000 pilots annually.***

Additionally, five of the seven largest passenger air carriers currently have the same if not more pilots now than they did in 2019 prior to the pandemic.

- United: 12,251 (2019), 11,840 (2020), 12,231 (2021)
- Delta: 13,082 (2019), 12,940 (2020), 13,180 (2021)
- JetBlue: 3,661 (2019), 3,715 (2020), 3,850 (2021)
- Alaska: 3,048 (2019), 2,974 (2020), 3,062 (2021)
- Spirit: 2,390 (2019), 2,497 (2020), 2,744 (2021)

Hiring at the major airlines has also increased at a rate never before seen. Between September 2019 and February 2020, the total number of pilots hired at the majors was 2,812. By comparison, from September 2021 to February 2022, the total number of pilots hired was 5,313—still under the total number of ATP and R-ATP certificates issued during this time period.

The 618 pilots hired in January 2020 was a new monthly record at the time. Recent data by month exceeds that figure (October: 791, November: 720, December: 982, January: 1,136, February: 1,049, March: 1,247).

After being propped up by American taxpayers, airlines are now canceling routes, cutting service to small and rural communities, and adding newer routes to more profitable leisure destinations. They've also increased by 65 percent the number of delayed or canceled flights due to their mismanagement.

Airlines are looking for ways to boost revenue and many are looking to shed labor costs in any way possible, all while trying to blame the hardworking Americans who flew throughout the pandemic at great risk to themselves and their families—and kept their airlines operating.

SkyWest in particular has been misleading Congress in multiple ways, even after banking more than $1 billion in taxpayer subsidies under the CARES Act. They currently have 466 more pilots than they did in 2019, yet are only flying 85 percent of their 2019 schedules. They claim there is a lack of available pilots, but there is simply a lack of pilots willing to work for the meager salaries offered.

Other airlines in direct competition with SkyWest and other regionals are offering far greater salaries, and SkyWest offers no flow-through or direct-hiring opportunities with any major airline, providing little incentive to join the company.

- Avelo boosted captain and first officer pay, plus signing bonuses.
- Breeze, Sun Country, CommutAir, and GoJet recently increased pay to attract new pilots.
- PSA/Envoy/Piedmont still have retention bonuses of $150,000.

For more information, see: *alpa.org/pilotsupply.*

*https://www.faa.gov/data_research/aviation_data_statistics/civil_airmen_statistics/

ALPA FACT SHEET

Pilot Retirement Age Facts

Raising the Retirement Age Will Not Increase Air Service

A Change to Pilot Retirement Age Introduces Risk into the Aviation System

- Increasing pilot mandatory retirement age beyond 65 increases risk in aviation.
- According to numerous studies, including one in 2017 by the *European Union Aviation Safety Agency (EASA)*, cognitive abilities decline with increasing age, and there is an increased risk of cardiovascular issues and diabetes.
- EASA concluded that retirement age should not be increased beyond 65 for pilots in multicrew airline operations.

A Change to Pilot Retirement Age Will **Not** Increase the Supply of Pilots as Intended

- Increasing the retirement age will displace pilots. Pilots over 65 will be forced to leave the most desirable international routes to bid for domestic ones operated by smaller aircraft with more frequency of operations, requiring retraining on different equipment and bumping less senior pilots to other routes and aircraft, increasing training time and costs to the airlines and those pilots as well.
- Claims that extending pilot retirement age will entice future aviators because of the additional years at high captain pay are false. As stated above, pilots beyond age 65 will operate domestic routes, likely on smaller equipment with no guarantee they remain as captains.
- Most regional airline pilots leave the regional industry long before age 65 for more lucrative jobs at mainline or low-cost carriers or other opportunities. Therefore, the pool of domestic-service pilots will not increase appreciably without additional training costs or disruptions.

A Change to Pilot Retirement Age Will **Not** Increase Service to Small Communities

- Airlines' decisions to fly to or leave certain destinations are market driven.
- There are more certificated pilots than there are pilot jobs, according to FAA and Bureau of Labor statistics.

What a Change in Mandatory Retirement Age Means Under Current Standards/ Legislation

- To permit pilots in Part 121 operations to fly beyond age 65, the United States would have to file a difference with ICAO from its standards on age for pilots in international commercial air transport operations with more than one pilot.
- Because the international ICAO standard limits pilots to age 65, any increase in U.S. age limit would result in:
  - Pilots over 65 would be limited to flying U.S. domestic flights only (similar to Canada and Japan, where the retirement age limit is over 65).
  - Older pilots would have to bid back to aircraft limited to domestic flying only.
    - Increased airline training costs
    - Less senior pilots may be bumped to different equipment, requiring additional training
  - Or, pilots over 65 could move to smaller "domestic only" airlines at the bottom of the pilot seniority list, an unlikely scenario
  - Additional medical scrutiny to mitigate potential safety risks due to increased age could be introduced:
    - Cognitive screening
    - EKG assessments

Current Requirements in Place

- Current ICAO standard is age 65 for captains and first officers in multipilot operations. There is no current international discussion to change the standard at ICAO.
- EASA regulation is age 65.

Legislative History

- Congress changed the pilot retirement age from 60 to 65 to align with ICAO standards in the Fair Treatment for Experienced Pilots Act (PL 110-135).
  - Signed into law on December 13, 2007

*https://www.easa.europa.eu/sites/default/files/dfu/EASA_REP_RESEA_2017_1.pdf