

Senate Commerce Subcommittee on Aviation Operations, Safety, and Security

**Written Statement of Dr. John Tracy, Chief Technology Officer and Senior Vice President,
Engineering, Operations & Technology,
The Boeing Company
Before the Commerce Subcommittee on Aviation Operations, Safety, and Security
United States Senate
Hearing on Threats to U.S. Competitiveness in Aviation
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Good morning, Chairwoman Cantwell, Ranking Member Thune, and members of the committee. On behalf of The Boeing Company, I thank you for convening this hearing and inviting us to share our thoughts. It is a privilege to be a participant on this panel and provide Boeing's view on the challenges faced by America's aviation industry.

Our diligent, talented employees are proud to be a part of one of the leading U.S. exporters of manufactured goods. We work hard to maintain this rank by turning today's discoveries into tomorrow's market-leading products. This spirit of technical achievement and the breakthrough-products and services that result from it exemplify why the United States holds the role as the global leader in aviation.

In an era where economic concerns top the national agenda, this role as the worldwide leader has tremendous importance to the United States and its workforce. Aviation helps drive our economy and contributes \$1.3 trillion annually in economic activity. It generates nearly 10.2 million jobs with \$394.4 billion in earnings. It creates \$785 billion annually in value-added economic activity. Aviation accounts for 5.2 percent of Gross Domestic Product and ships more than \$562 billion in goods and products each year.

Because of these economic benefits, it is no surprise to realize that a growing number of international competitors aspire to erode the United States' role as the global leader in our industry. We do not fear this new competition. But we need to ensure that countries compete on an even playing field, and for us that means ensuring full compliance by European governments with last year's WTO ruling against \$18 billion in illegal subsidies to Airbus. Members of Congress on both sides of the aisle and in both chambers have stood shoulder-to-shoulder with the USTR on this issue, and we are very grateful for that support.

We were asked to highlight the issues that we believe most threaten American competitiveness in aviation. I'd like to address these concerns and explain why these are important to aviation, to Boeing and to the American worker. As I discuss these concerns, I believe you'll recognize that they all share this common aspect: A deficiency in the federal support given to these issues would jeopardize our industry and the jobs within it.

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First, I would like to discuss the workforce-related topic of the looming shortage in key skills, especially in science, technology, engineering and mathematics, or STEM.

At Boeing, we are continuing to hire—to replace attrition and to maintain an influx of new and diverse talent as we seek new growth opportunities globally. In fact, as of May 31, we had 173,167 employees - an increase of almost 11 percent from five years ago.

We are fortunate to be able to continue to attract and develop the best and brightest people who design and build the world's greatest aerospace products. We have a strategic workforce planning process that allows us to understand business requirements and forecast near- and long-term skill needs. By doing so, we develop employees in the right areas and maintain focus on hiring and retaining talents that are key to meeting our business needs and ensuring future competitiveness.

However, with about 76 million baby boomers nearing retirement in the United States, technology-based companies like Boeing face a skills shortage as fewer people gain the qualifications needed for the high-tech jobs of today and tomorrow, including those in aerospace. At Boeing, the average age of our employees is 48, which is only seven years shy of our retirement eligibility. In addition, the Aerospace Industries Association estimates that while the U.S. graduates approximately 70,000 engineers each year, only 44,000 are eligible for aerospace careers due to security clearance requirements.

Simply put, we need more young Americans to pursue education and careers in STEM-related fields.

I'd like to emphasize one point about these facts. No doubt, today's unemployment rate is a macroeconomic concern. However, Boeing, along with other high-tech companies, faces a shortage of skills, not labor. That's why we are working hard to prepare the future workforce for tomorrow's jobs and careers by advocating for improvements in education at all levels, particularly in STEM disciplines. In 2011, Boeing invested about \$35 million towards external education programs, with about \$27 million directed toward STEM programs to inspire the engineers, scientists and technologists of tomorrow.

Beyond financial support, we've taken broad steps with educators, government, industry and others to help create a pipeline of technically educated and skilled workers suited for the jobs and challenges of a global economy.

We partner with community and technical colleges to help develop programs that train workers in cutting-edge aerospace manufacturing skills. These recruitment, pre-hire and workforce training programs enable students to earn - certificates that better prepare themselves for jobs with Boeing and other aerospace companies.

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Our summer internship program is currently in full swing, with more than 1,700 interns—nearly 500 more than in 2010—joining Boeing business units around the world. In 2010, Boeing converted nearly two-thirds of interns into full-time Boeing employees, a higher rate than industry averages.

Many of our employees and retirees also do their part by participating in skills-based volunteering in programs, such as FIRST Robotics and others, to capture the imaginations of young people about the possibilities offered by technical careers. These are just a few examples of our efforts to help equip our citizens with the education and skills required for STEM jobs.

As Boeing's chief technology officer, I am keenly aware of how innovation depends on a talented workforce that is technically skilled, has a passion for discovery, and is ready to work collaboratively to bring breakthrough products to life. Nothing is more fundamental to sustaining our ability to compete and win in a global economy than a strong pipeline of skilled workers. It thus follows that without these people, our products and the economic benefits they generate would not exist today and would not be created tomorrow.

To design and create the innovative products and services that make the United States the global leader in aviation, companies in our industry also execute a vigorous slate of research and development activities.

Our industry invests billions of dollars each year in R&D. Boeing, for example, spent \$3.9 billion in R&D in 2011. But companies cannot afford R&D programs that provide little-to-no return for 15-20 years. And in the aviation industry, it can take that long, if not longer, for a technology to move from discovery to maturation to commercialization and implementation on a product.

For example, last fall we delivered our first 787 Dreamliner airplane, which is made mainly of carbon fiber composite materials. While this technology appeared possible for aircraft nearly a half-century ago, it took many decades of experimentation, development, testing, and maturing. The 787, in particular, took almost two decades to reach a point where the proven processes of creating carbon fiber composites could be validated as both technology- and production-ready.

The basic scientific research that is supported by federal investments lays the foundation for industries and jobs of tomorrow—and helps ensure America retains its technology advantage. By commercializing findings from government-supported basic research, U.S. companies are able to generate a strong return in this government investment by creating jobs and strengthening the nation's economy.

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I want to make it clear that when it comes to commercial application of new technologies developed with government support, private industry pays the tab. Boeing has always stood up to that responsibility. However, we see several areas in which stronger government support of specific programs would improve our industry's global competitiveness. These areas include:

- **Federal R&D funding.** Federal R&D plays a big role in innovation and advancement. Yet our in-house research has shown that federal support for civil aeronautics research and development in the United States has declined significantly. Data for 2010 (the most recent year that data is available) shows that in absolute dollar terms, the U.S. government spent only about 10 percent of what the European Union spent as a whole.
- **The ecoDemonstrator Program.** In July of 2011, Boeing announced a partnership with American Airlines and the FAA to kickoff the ecoDemonstrator Program with a 737-800 airplane that will be a flying testbed for environmentally progressive technologies. This type of partnership helps prove out development technologies quicker and can lead to commercialization of the technology even faster.
- **Public aviation research infrastructure.** In past years, NASA possessed state-of-the-art aviation infrastructure for research and development, including best-in-the-world wind tunnels and other testing facilities. However, NASA has not maintained its cutting-edge facilities and, as a consequence, Boeing has had to turn to overseas facilities to carry out related research, often at much greater cost. Federal infrastructure is a big enabler of private sector R&D. So this loss of capacity has been an impediment and has driven up research costs.
- **Commercialization of federally-funded research.** The research that is carried out using federal funds, whether in collaborations with universities, through federal grants, or in direct partnership with the government, often incurs a complex intellectual property regime. This situation significantly slows the transition of new technology to the private sector for commercialization. Reducing this hurdle and facilitating the transition of this technology for commercial use would be a big help to the civil aeronautics industry.
- **Clearer frameworks for proposed joint initiatives.** Collaborative frameworks for joint research proposed by the government are often vague and unfocused, resulting in companies not wanting to take part. Success of any initiative cannot be expected unless it is advantageous to participate. Aspects for developing clear frameworks can include finding common ground for industry-wide collaboration, handling

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intellectual property more efficiently, and defining which aspects can be readily shared.

We believe that resolution on these matters would enable the federal government to maximize the return on the investment it makes in innovation—and spur job creation in an industry led globally by the United States.

Another area of innovation I would like to discuss is the need to improve the U.S. air traffic management system.

Air traffic demand in the United States and the world is expanding at an accelerating rate. More than 1,500 airlines operate a total fleet of nearly 24,000 aircraft worldwide. They serve almost 4,000 airports through a route network of several million miles managed by roughly 190 air navigation service providers.

The current air traffic control system, designed and built on 1950s and 60s assumptions of aircraft systems and limited technology, required a ground based surveillance and control system. The current air traffic control system is not scalable, is overly labor intensive and does not take advantage of new technologies in aircraft, ground systems and networked concepts. Today's system is built on layered, incremental changes that occurred over half a century, many reflecting mandated safety improvements. Much of these changes are based on the assumptions that are no longer valid, such as:

- Aircraft cannot determine their position except in gross distances.
- Navigation is limited in the aircraft and requires augmentation from the ground.
- Aircraft cannot determine where other aircraft are.
- The sole purpose of air traffic control is the separation of aircraft.

The good news is that we know there is broad agreement on what needs to be done to modernize the system. We are grateful for the efforts of this Committee to include in the most recent reauthorization strong accountability measures and a path forward for NextGen acceleration.

We are excited about how NextGen will transform our current ground-based radar system using more precise Global Positioning System (GPS) technology and other existing technologies to shorten routes, save time and fuel, reduce air traffic and weather delays, increase capacity, and permit air traffic controllers to monitor and manage aircraft with greater safety margins. Aircraft will be able to fly closer together, take more direct routes and avoid delays caused by weather. NextGen technologies also will enable controllers to orchestrate more efficient arrival and departure streams in and around busy airports.

The FAA estimates that increasing congestion in the air transportation system will cost the American economy \$22 billion annually in lost economic activity if NextGen is not implemented. Once implemented, NextGen will allow pilots greater freedom to select their

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own direct flight path rather than using the current grid-like highway-in-the-sky system. Boeing planes are already equipped with NextGen avionics, which allow pilots to know both their current location with great precision, plus positions at future points. Aircraft equipped with NextGen avionics are able to provide such aircraft intent information to ground control, which helps them land and take-off faster, navigate through weather better and reduce taxi times, so that flights and airports are able to run more efficiently.

NextGen also will deliver environmental benefits. Airline operations produced 745 million tons of CO₂ in 2011, about 2 percent of total human carbon emissions. When fully implemented, NextGen will deliver up to a 12 percent reduction (112 million pounds per year less of CO₂) in aviation's environmental impact by enabling airplanes to save up to 1,100 pounds of fuel - and up to 3,400 pounds of CO₂ - per flight.

Boeing is working with industry and the FAA to develop ways to speed up implementation of NextGen. We are working to incentivize early equipage; to develop and implement tailored arrivals at major airports that reduce emissions and noise; and to accelerate required navigation performance to take advantage of the precision navigation capabilities of modern aircraft to allow shorter, more fuel efficient arrival and departure trajectories for airports.

Boeing Commercial Airplanes' highest priority remains steadfast on ensuring safety of our products and their operation within our global transportation system. That is another reason we see NextGen as a key enabler to a better future. The new procedures associated with NextGen will provide clear safety benefits, while handling today's traffic and tomorrow's increased air traffic. We at Boeing believe the FAA's NextGen program needs to be a funding priority because it's an investment in U.S. transportation infrastructure that will pay enormous dividends downstream for the U.S. economy and further enable a safe, efficient aviation system. Again, we thank the Committee for their continued support of this effort.

The last concern I'd like to address is the challenge of aircraft certification support.

Last year, 2011, was extremely memorable for The Boeing Company, as we worked intensely to get two new airplanes, the 787 Dreamliner and the 747-8, certified by the FAA and delivered to our customers. Getting both market-setting airplanes certified in the same year required a monumental effort by industry partners around the globe and the FAA. We are grateful to the agency and its people for their support.

To meet the evolving needs and demands of our customers, we have additional new products in the works. This includes the 737 MAX, an updated version of our best-selling 737 airplane that will deliver 13 percent better fuel efficiency than today. Our 787-9 Dreamliner, a slightly bigger version of the 787-8, is in work to further improve on the technology and super-efficient performance aspects of our carbon fiber-based airplane

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model. Also among these products are derivative aircraft that will serve military purposes - most notably, the KC-46 aerial refueling tanker for the U.S. Air Force, which is based on our 767 airplane.

As we look forward to future business, it is clear that reforms are needed in FAA certification processes, so that the American aviation industry becomes a stronger competitor in the global marketplace - and is able to grow and increase its workforce.

One key way to help streamline these processes is for Congress to accept the recommendations and reports from the Aviation Rulemaking Committees (ARCs) mandated by the re-authorization bill for the FAA, so that these reports serve as direction to FAA leadership.

The FAA has limited capacity and must handle competing priorities because it supports the entire product lifecycle, and not just certification and rulemaking. The ARCs observed that there are many existing improvement initiatives for certification process efficiencies already implemented or are in progress. However, the FAA has not fully integrated these initiatives, overseen their implementation, measured their benefits, or clearly linked them to a future state.

The ARCs believe the best opportunity for efficiency gain today in the current state of the certification process is to develop comprehensive implementation plans and develop a tracking and monitoring process to ensure effectiveness, and to maximize delegation to the greatest extent in current delegation systems. With delegation and efficient measurement of oversight systems, regulators can place increased focus on the most critical areas to enhance safety and provide faster service to the public. Delegation also reduces cost to the government by leveraging the technical expertise already in industry, while providing an extra layer of safety culture throughout companies as they develop, approve and use delegation processes under FAA oversight.

Furthermore, it is equally important to recognize the benefit and global fit of increased delegation and operational efficiencies within international regulatory sectors. Capacity created by improved efficiencies and expanded delegation is a key enabler for continued FAA international leadership—both in dealings with other regulatory agencies such as the European Aviation Safety Administration, as well as in assisting developing countries to accept FAA certification instead of building their own separate systems.

The ARCs, which by nature of their composition and charter provide joint FAA/Industry perspective and conclusions, have spelled out recommendations for streamlining and reengineering the aircraft certification process, and for making other process reforms and efficiencies. We strongly advocate for the adoption of these recommendations and believe their implementation would make the FAA a stronger, streamlined agency that's better able to execute its duties in a faster and more cost-efficient manner. And by doing this, the

agency helps support the jobs of this industry and is able to maximize the benefit generated by its resources.

Conclusion

In closing, we see as the key threats to American competitiveness in the aviation industry:

- A looming skills shortage;
- The level of federally supported research on basic science;
- The constraints of our current air traffic control system; and
- Inefficient support of aircraft certification efforts.

Each of these topics is an area where the federal government has an influence. We recognize that Congress faces the difficult task of ensuring that federal expenditures address our nation's financial obligations and generate the greatest benefit to the American people. However, we would also strongly caution against making cuts to investments that would jeopardize our nation's ability to compete in this industry, as well as other high-tech fields. Such reductions would be analogous to eating one's seed corn - and would hamper our capability to sustain our technical advantage.

To ensure our competitiveness in the global marketplace, our industry needs top-notch infrastructure, robust R&D programs, efficient regulatory processes and a well-educated workforce. These factors will help sustain the technology advantages that our industry holds over its global competitors - and will help current and future generations of Americans enjoy the American dream.

Again, and on behalf of The Boeing Company, I thank the Committee members for their time and the opportunity to address this issue.