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THE GLOBAL COMPETITIVENESS OF THE U.S. AVIATION INDUSTRY: ADDRESSING COMPETITION ISSUES TO MAINTAIN U.S. LEADERSHIP IN THE AEROSPACE MARKET

HEARING

BEFORE THE

SUBCOMMITTEE ON AVIATION OPERATIONS, SAFETY, AND SECURITY

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE

ONE HUNDRED TWELFTH CONGRESS

SECOND SESSION

JULY 18, 2012

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THE GLOBAL COMPETITIVENESS OF THE U.S. AVIATION INDUSTRY: ADDRESSING COMPETITION ISSUES TO MAINTAIN U.S. LEADERSHIP IN THE AEROSPACE MARKET

WEDNESDAY, JULY 18, 2012

U.S. SENATE,
SUBCOMMITTEE ON AVIATION OPERATIONS, SAFETY, AND SECURITY,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Committee met, pursuant to notice, at 3:01 p.m. in room SR–253, Russell Senate Office Building, Hon. Maria Cantwell, Chairman of the Subcommittee, presiding.

OPENING STATEMENT OF HON. MARIA CANTWELL, U.S. SENATOR FROM WASHINGTON

Senator CANTWELL. Good afternoon. The Senate Committee on Commerce, Science, and Transportation Subcommittee on Aviation Operations, Safety, and Security will come to order.

I thank the witnesses for being here today for such an important hearing. I want to welcome each of them: from Chicago, Dr. John Tracy, Chief Technology Officer and Senior Vice President of Engineering and Operations for The Boeing Company; Dan Elwell, Vice President, Civil Aviation, Aerospace Industries Association—welcome; Stan Sorscher, Labor Representative for the Society for Professional Engineering Employees in Aerospace—thank you for being here; Mr. Pete Bunce, President and Chief Executive Officer for the General Aviation Manufacturing Association; and, certainly not last in the regards to the importance to the sector, but very important, Mr. Nick Calio, President and Chief Executive Officer of Airlines for America.

So welcome, gentlemen. Thank you all for being here.

And I thank my colleague, the Ranking Member of the Subcommittee, for being here, and I know we're going to hear from many of our other colleagues as well.

Today's witnesses are a broad cross-section of America's aviation sector, and we must take this opportunity to promote innovative strategies that will secure our future in the world and the marketplace. The U.S. aviation sector is vital to our nation's economy. According to the FAA, in 2009, the U.S. aviation industry supported more than 10 million direct and indirect jobs and contributed more than $1.3 trillion to our economy, which is about 5.2 percent of our overall gross domestic product.

The manufacturing of civil aircraft and components provided for more than 1 million jobs and provided $185 billion in economic activity. And international sales of these aviation parts added up to about $75 billion, making aerospace our largest export industry, a key contributor to reducing our overall trade imbalance.

With the projections for future growth, the aerospace industry represents a great opportunity for job growth in America, but only if we take the right actions necessary to make sure that we stay competitive. Today's hearing is about seizing on those opportunities.

The aviation industry is critical to our economy because it facilitates commerce by connecting regions of the country and other fast-growing parts of the world, and we want to make sure that we are continuing to improve the quality of air service. Industries with perishable items and cargo such as fruits and vegetables and many other things count on aviation, as does our tourism industry and many other aspects of our economy.

But despite the success in the growing economic sector of aerospace, we see a lot of competition and, obviously, financial challenges. In the manufacturing sector, low-cost competition from developing countries, where sectors are developing, like Brazil, Russia, and China, has added to the challenges already that we are seeing from competition from Europe, Canada, and Japan.

Boeing and Airbus have dominated the market for large commercial aircraft, but Canada and Brazil have both made substantial contributions in regional jet markets. So there are also a growing number of concerns in the general aviation sector. While the makers of large general aviation aircraft appear to have made it through some economic downturns fairly well, smaller manufacturers have been hard hit.

And it is also clear that China is pursuing the technical capability to compete in all sectors of aircraft manufacturing. Just last week, a Chinese firm purchased a controlling interest in the civil aviation operations of Hawker Beechcraft, a longtime Wichita-based aviation manufacturing company.

So, meanwhile, the domestic airline industries continue a very steep financial climb out of their challenges emerging from where they were when they lost more than $60 billion and multiple airlines filed bankruptcy. So though these recent financial reports have demonstrated there is improvement, the margins still remain very narrow.

The U.S. airline industry as a whole made a net profit of $2.7 billion in 2010 and $390 million in 2011. These first quarter earnings in 2011 included a net profit of $228 million for the 10 largest airlines, which translates into a 0.7 percent profit margin.

So these financial challenges have definitely taken their toll on the aviation workforce, and the airlines shed 160,000 jobs—or about 20 percent of its total workforce. And those employees have been challenged with all sorts of wage cuts and benefit cuts.

So the issue that we want to talk about today is how we can continue to weather the economic challenges and continue to grow the sector. Combined with the need to replace aging aircraft, commercial passenger traffic in the U.S. alone is expected to increase 90 percent by 2032, from 730 million passengers to about 1.2 billion

passengers, and that is a projected 3 percent annual growth. And, as I mentioned, with aircraft orders, Boeing's latest forecast indicates airlines will need another 34,000 aircraft over the next 20 years, valued at $4.5 trillion.

So in addition to the transformation of the air traffic management system through our satellite system, there are many things that we're doing to try to improve our competitiveness. I hope to hear a lot from the panelists about our workforce needs and what we can do to address the needs that we are seeing with an aging workforce, how we can match up our unemployment with this incredible job opportunity that we're looking at, how do we get more of our young students interested in aviation careers, and how do we get our returning veterans to fill some of these job needs.

One estimate is that national projections are we will need 82,000 pilots and 143,000 maintenance workers over the next 20 years. So that's a good problem to solve compared to many of our others.

So I look forward to hearing about that, about our FAA certification process and what we can do to streamline that and make it easier and more efficient, how we can more cost effectively implement the next generation system which will help us be competitive on an international basis, and what else we can do to make sure that we are innovating here in the United States and keeping our competitive edge.

So, again, thank you, gentlemen. We look forward to hearing from you. And I'd like to turn to the Ranking Member, Senator Thune, for an opening statement.

STATEMENT OF HON. JOHN THUNE,
U.S. SENATOR FROM SOUTH DAKOTA

Senator THUNE. Thank you, Madam Chair. And I, too, want to thank our witnesses for appearing today and for sharing their insights about the state of aviation in this country.

The United States is a leader in aerospace design and manufacturing, which is also the source of thousands of high-quality jobs. We've always had a tradition of building advanced aircraft and introducing new technologies that can provide for superior safety travel experiences for the American passenger.

However, in an economy barely coming out of a recession, the aviation industry is struggling to hold on while facing high taxes both at home and abroad, highly volatile fuel prices, and an increasing number of regulations. It is important that we reduce the tax burdens on airlines which are inevitably passed on to the American traveling public.

Apart from the high departure and arrival taxes for flying into countries like Germany and the U.K., our airlines are now expected to pay a tax to the European Union as part of their emissions trading system. This is clearly a unilateral tax grab on American operators without any guarantees for how those revenues are going to be used.

I look forward to hearing from our witnesses today on how this tax could affect aviation competitiveness. Additionally, I hope that the witnesses can highlight the important role small businesses play in the aviation industry. While many know that small businesses play an important role in the overall economy, I think most

are surprised at how significantly small businesses impact the aviation industry, be it in the area of innovation, employee development, component manufacturing, FAA contracting, or just as a consumer. Without small businesses, the U.S. aviation industry would not be the leader that it is today.

However, like small businesses throughout the nation, aviation-focused small businesses also face considerable challenges, and I look forward to hearing what can be done to reverse this trend. Ultimately, our goal should be to retain our global leadership position in the aerospace industry. And the solutions have to include lower taxes, less regulation, more innovation, and greater energy independence.

Madam Chairwoman, thank you again for holding this hearing. I look forward to hearing from our witnesses and interacting with them about the future of this industry.

Thank you.

Senator CANTWELL. Thank you.

Do either of my colleagues have a quick comment before we start the panel, since you were both here on time and ready to go?

Senator WARNER. I just want to thank the Chair for holding this hearing. I'm very anxious to get the panel's view on some work we're trying to do on advanced composites and the potential that it has for the industry.

Senator CANTWELL. Senator Isakson?

STATEMENT OF HON. JOHNNY ISAKSON, U.S. SENATOR FROM GEORGIA

Senator ISAKSON. I want to acknowledge, too, the Chair for calling this meeting. It's very important. And representing a state that's the home to Delta, the busiest airport in the world, Gulfstream and Lockheed Martin, there is no more critical issue in my state than aerospace.

[The prepared statement of Senator Isakson follows:]

PREPARED STATEMENT OF HON. JOHNNY ISAKSON, U.S. SENATOR FROM GEORGIA

Thank you Madam Chairman. This is a very timely hearing because just this week alone news broke, which I am including for the record, about the potential purchase of the iconic Hawker-Beechcraft company by a Chinese entity that it 40 percent owned by the Chinese government. Now, there may be some questions as to whether the Chinese firm, Superior Aviation, can ultimately come up with the financing to meet the $1.8 billion asking price, but this story underscores what this hearing is about: in a globalized economy Madam Chairman if we don't create the competitive conditions to keep manufacturing like this in the United States, well capitalized foreign entities that see great opportunity in these companies will snap them up and possibly move their operations to other nations that are more business friendly.

This is an industry that means 10 million jobs $1.3 trillion in total economic activity, and 5.2 percent of the gross domestic product for our economy in 2009 alone, the last year we have data to measure it by. This is an industry that, even though the U.S. has had a total negative trade balance since 1971 (it was at -$500 billion in 2009), means a $75 billion positive impact on the trade balance as civil aircraft engines, equipment, and parts contributed to the top net exports of the last decade.

For Georgia the aerospace manufacturing industry accounts for over 8,300 employees over 13 different companies, over $581 million in payroll, and over $474 million spent to secondary and tertiary suppliers in Georgia. For example Savannah is the home of Gulfstream, the premier business aviation manufacturer in the world. In 2010 Gulfstream announced a $500-million, seven-year plan to ensure that the company is well-positioned to meet future demand for business-jet aircraft and sup-

port services. The growth is expected to result in 1,000 additional Gulfstream jobs, an increase of more than 15 percent from Gulfstream's current Savannah employment level of approximately 5,500 employees. The expansion would include building new facilities at the northwest quadrant of the Savannah Airport, renovating several existing facilities on the main campus off Gulfstream Road and expanding office and lab facilities at the Gulfstream Research Development Center in Crossroads Business Park. The expansion of Gulfstream's facilities will have a major impact on both the state and local economies by creating 1,000 new full-time jobs, not to mention the ripple effects in terms of construction and service workers, as well.

Gulfstream has thrived in our state because we have made an effort to partner with them to create conditions whereby they can be successful. For example, one of the programs we have in Georgia is a good "best practices" example. We have developed Quick Start, which is an internationally acclaimed program providing customized training free-of-charge to qualified new, expanding and existing businesses. Quick Start is one of my state's most important economic development incentives for attracting new investment to the state and promoting job creation. As Gulfstream recently announced their major expansions a collaboration among Quick Start, Savannah Technical College and Gulfstream has helped in the past, and will help moving forward, to create training opportunities for local individuals so they would have the skills needed to take advantage of the opportunities at Gulfstream.

The Federal Government should partner with this industry in the same way. For example, I have strong concerns about FAA's timely certification of new products. Companies in my state, like Gulfstream for example who are trying to certify their new G650, have outlined these same concerns to me. In the past we have heard the right things from FAA in how they're going to solve these problems, but their actions have never followed up. I certainly don't want to see impediments to bringing new products to market but the FAA needs to develop certification processes and partner with industry to move these processes forward instead of being an impediment to innovation and growth.

Gulfstream recently opened a repair station in Brazil to serve its South American customers and is working towards opening one in China, but as is running into roadblocks every step of the way with both DHS and TSA. Inaction by DHS for the past decade has caused uncertainty in certifying the security of these stations, leading to lost opportunities. The inaction of our government has real world consequences and prevents our manufacturers from supporting their customers all over the globe.

On June 7 I wrote Secretary LaHood, and I am including my letter for the record, encouraging the Administration to file an Article 84 complaint in the International Civil Aviation Organization against the European Union's Emissions Trading Scheme (EU–ETS). This Committee recently held a hearing on the matter and there was strong bipartisan support for filing such a complaint, yet the Administration has not acted to halt the EU's unilateral and unprecedented action.

Madam Chairman, I fear that if we do not take these and other common sense steps to level the competitive playing field for our aerospace manufacturers, then we will see more companies go the way of Hawker-Beechcraft. Thank you Madam Chairman.

UNITED STATES SENATE
Washington, DC, June 7, 2012

Hon. RAY LAHOOD,
Secretary of Transportation,
U.S. Department of Transportation,
Washington, DC.

Secretary LaHood:

Thank you for your testimony yesterday before the Commerce Committee on the issue of the European Union's Emission Trading Scheme (EU–ETS) and its impact on America's aviation industry. I appreciated your candid views and strong opposition to the EU's plan.

I would strongly encourage the Administration to file a formal Article 84 complaint against the EU on this issue in the International Civil Aviation Organization (ICAO). I believe you would find significant bipartisan support for the complaint in the House and Senate. I appreciate your consideration of my views, and I look forward to your response. Should you or your staff have any questions or need any

more information, please do not hesitate to contact me or Michael Quiello on my staff.

Sincerely,

JOHNNY ISAKSON,
United States Senator.

Business Aviation—July 16, 2012

HAWKER BEECHCRAFT'S FUTURE MAY REST WITH CHINESE

By Staff

Hawker Beechcraft's proposed sale to a Chinese firm was not a complete surprise. But that the smaller Superior Aviation Beijing emerged as the possible bidder instead of the larger AVIC or CAIGA leaves some industry experts wondering whether the deal will close at the $1.79 billion asking price.

Hawker Beechcraft announced July 9 that it had reached an exclusivity agreement to explore the potential sale of all but its military business to Superior Air Beijing.

The U.S. Bankruptcy Court for the Southern District of New York has scheduled a hearing July 17 to consider Hawker Beechcraft's request to enter into exclusive negotiations and a "refund" agreement for the company's sale.

Under the exclusivity agreement, the companies would negotiate a definitive accord over 45 days. During this time, Superior Air would provide up to $50 million in funding "to maintain certain product lines that [Hawker Beechcraft] would likely discontinue," according to court documents.

Hawker Beechcraft has not said which lines are at risk, but a company presentation made this spring detailed the likelihood of shelving the Premier and/or Hawker 4000 programs, along with the permanent disbanding of the Hawker 400.

Hawker Beechcraft, which filed for Chapter 11 bankruptcy protection May 3, had evaluated operating as a standalone entity, in addition to accepting eight bids for the potential sale of some or all of the company. The company on June 30 filed a preliminary plan of reorganization as a standalone entity that would have ownership of Hawker Beechcraft transfer from Goldman Sachs and Onex to its creditors, and in exchange some $2.5 billion in debt would be erased. But at the same time, Hawker Beechcraft held open the possibility of selling the company.

Hawker Beechcraft says if it is unable to reach agreement with Superior Air Beijing in a timely manner, it would then move forward on its preliminary plan of reorganization.

Hawker Beechcraft would be unable to sell its military business to the Chinese firm, and the proposed deal includes a potential refund of up to $400 million "depending upon the price which the debtors received for the defense-related businesses" (see related article on Page 7).

Once a definitive agreement is reached (should it be reached), then the transaction must proceed through the normal bankruptcy process, and the Superior bid would serve as the stalking horse for competing proposals. The sale also would need to undergo a series of regulatory reviews.

'Greatest Value'

Hawker Beechcraft has stressed that the Superior proposal "would create the greatest value for the company and position it for long-term growth," and says it provides the most continuity for the business.

In announcing the sale, Hawker Beechcraft Inc. CEO Steve Miller notes Superior has had a "long-standing interest in the commercial aircraft business of Hawker Beechcraft."

Longtime Dassault Falcon veteran and current industry analyst Brian Foley notes that Superior's name had surfaced in the past, so the fact that it emerged as the leading bidder was not out of the blue.

But Foley adds he found it curious that it was Superior over China's well-established AVIC or China Aviation Industry General Aircraft Co. (CAIGA), both of which have already set up manufacturing bases.

Superior, which is 60 percent owned by a private entity and 40 percent by the Beijing municipal government, gained a foothold in the aerospace realm with its 2007 acquisition of Brantly International, a maker of small helicopters. The company moved Brantly tooling to China and developed the aircraft as a UAV.

The company subsequently purchased general aviation piston-engine parts maker Superior Air Parts out of bankruptcy and took on the name Superior Aviation Bei-

jing. Superior remains in Texas, but the firm constructed a plant in China to make small piston aircraft engines for the regional market.

But all of that amounts to a much smaller player in the aerospace market, particularly next to a company the size of Hawker Beechcraft. "It's not a complete unknown, but it's a small business compared to Hawker Beechcraft," notes Jack Pelton, the former Cessna executive who helped engineer the agreement for Cessna's Skycatcher light-sport aircraft to be developed by AVIC subsidiary Shenyang Aircraft Corp.

Richard Aboulafia, Vice President-Analysis at the Teal Group, agrees. "What an exceedingly odd announcement," he says. "If AVIC/CAIGA [established Chinese aircraft manufacturers] were behind this, that would be one thing. But we're talking about a much smaller and less well connected entity here."

"We were expecting a Chinese buyer, but not this one," Frederico Fleury Curado, CEO of rival Embraer, said during the Farnborough airshow. "We were expecting an established buyer."

'That's Not Going Down'

Aboulafia questioned whether Superior would have the resources to meet the announced $1.79 billion cash sale. "They're not showing up with $1.8 billion here; that's not going down."

Foley concedes that the purchase price was surprising, but he notes that General Dynamics initially raised eyebrows with its purchase of Gulfstream, but that turned out to be a strong investment.

Hawker Beechcraft also stresses that Superior intends to provide a substantial investment into the product lines. But Pelton notes that upgrading or developing an entirely new aircraft can cost $180 million to $700 million or more depending upon its complexity and that Hawker Beechcraft will require several such investments because "long term they'll still be in a spiral unless they invest."

Superior may have the ability to draw on the resources of its second major investor—the City of Beijing—which might well want to establish a business aviation manufacturing base. But that would be a long-term and costly venture to establish such a presence in the city.

In the interim, Hawker Beechcraft has stated unequivocally that Superior plans to maintain the company's U.S. presence and that the deal would save thousands of jobs in Wichita and Little Rock, Ark.

Wichita Mayor Carl Brewer has been cautious about the move. "The city is working to gain a better understanding of how the proposed acquisition may impact our community," Brewer says. "We're encouraged by Hawker's statement . . . which indicated Superior intends to maintain Hawker Beechcraft's U.S. headquarters, management team and employees and continue product development throughout its commercial lines."

Kansas Gov. Sam Brownback, meanwhile, finds the deal appealing if it helps employment in his state. "My major concern . . . is the jobs in Kansas. Wichita is the air capital of the world, and we've got more major air companies there than anyplace in the world: Boeing, Airbus and all the [general aviation]," he says. "We want to grow those jobs."

The good news, Foley notes, is that the companies have stated up front that employment and production will stay in Wichita. When CAIGA purchased Cirrus, it promised to keep production in Duluth, Minn., and so far has kept it there, Foley notes.

But Foley does not rule out the possibility of some Hawker Beechcraft production lines opening in China for local sales down the road.

Chinese executives have expressed a strong desire to build up their aviation manufacturing base. It's too early to tell what, if any production would launch there, he says.

If the deal should go through as announced, Foley says the proposed agreement would be "the best possible outcome for Hawker Beechcraft. It's a very good deal for Hawker and its creditors."

Competitively, he adds, the potential deal will mean "Hawker is not going away, we're not going from six to five major manufacturers." But it could be argued that it's a "little crowded" at the mid-and small-size jet range, he says.

http://www.aviationweek.com/Article.aspx?id=/article-xml/bav__07__16__2012__p01-01-476697.xml

Source: *Aviation Week & Space Technology*—July 16, 2012

HAWKER BEECHCRAFT'S PENDING $1.79 BILLION SALE FACES HURDLES

By William Garvey, Kerry Lynch (Washington)

Hawker Beechcraft's announcement of its potential sale to a small Chinese company for $1.79 billion could mark the beginning of the end of a decades-long period of missed opportunities and missteps at what had been among general aviation's most solid manufacturers.

Many in Hawker Beechcraft's Wichita headquarters regard the buyout as the best option, but others elsewhere are skeptical about the offer's substance and the future of the company.

Specifically, Hawker Beechcraft, which filed for Chapter 11 bankruptcy protection May 3, announced July 9 that it had entered an "exclusivity agreement" with Superior Aviation Beijing Co. Ltd., lasting 45 days, during which the two will attempt to finalize details of the takeover. If that occurs, Superior would serve as a stalking horse in an open bidding process. During the exclusivity period, Superior is to provide Hawker Beechcraft with up to $50 million to continue business-jet production.

Superior has said it would keep Hawker Beechcraft's existing operations in the U.S. and retain its employees and executives. No mention was made of also establishing manufacturing operations in China, though that seems a likely eventuality, considering the prestige the Chinese attach to aircraft-building and the country's vast market potential for such products.

Notably, the transaction would not include Hawker Beechcraft Defense Co. (HBDC), which makes the T–6A/B military trainer and is developing a tactical version, the AT–6. However, if HBDC is sold separately, up to $400 million from its divestiture would go to Superior.

Should Hawker Beechcraft fail to be acquired, it plans to emerge from bankruptcy as a standalone entity whose ownership would transfer from Goldman Sachs and Canada's Onex Corp., which acquired it from Raytheon in 2007, and to its creditors. That would erase $2.5 billion of debt.

While the news stirred hope among fretful Hawker Beechcraft employees, their reaction was hardly universal. "What an exceedingly odd announcement," comments Richard Aboulafia, vice president-Analysis, at the Teal Group. "If AVIC/Caiga [established Chinese aircraft manufacturers] were behind this, that would be one thing. But we're talking about a much smaller and less well-connected entity."

Indeed. Hawker Beechcraft identified Superior as an "aerospace manufacturer," but the adjective appears inflated.

The Chinese company, which is 60 percent owned by a private entity and 40 percent by the Beijing municipal government, came into being in 2010 when the venture bought Superior Air Parts, a bankrupt Texas parts maker for general aviation piston engines. A few years earlier the same Chinese venture purchased Brantly, an often-failed maker of small helicopters. Those subsidiaries are now co-located in Coppell, Texas. However, all of Brantly's tooling was moved to China, where the helicopter is being developed as a UAV. Meanwhile, Superior Beijing manufactures small piston aircraft engines for the Asian market.

Jack Pelton, the former head of Cessna Aircraft, expresses surprise at the acquirer. "It's not a complete unknown," he says, "but it's a small business compared to Hawker Beechcraft."

The deal is also a surprise to Frederico Fleury Curado, CEO of Embraer, a competitor in both business jets and military trainers. "We were expecting a Chinese buyer, but not this one," he said. "We were expecting an established buyer."

Aboulafia is less guarded. "We're looking at the people who bought Brantly," he says. "They're not showing up with $1.8 billion here; that's not going down."

A Superior takeover will have to receive bankruptcy court approval and be blessed by the Committee on Foreign Investment in the U.S., a Federal inter-agency group that will weigh the deal's national security implications.

While HBDC would not be involved, the King Air would, and the Pentagon operates hundreds of them, most importantly as intelligence, surveillance and reconnaissance (ISR) platforms.

The idea of a King Air produced by a Chinese-owned company does not bother Lt. Gen. Larry James, U.S. Air Force deputy chief of staff for ISR. "If you are talking just about the airframe, it's not a state-of-the-art," he says. Nevertheless, it is impossible to predict how a sale to the Chinese of such an iconic American brand might play out in Washington.

James's comments touched on a larger problem. Introduced in 1964, and with some 7,000 units delivered, the King Air has been Hawker Beechcraft's cash cow.

However, management's understandable enthusiasm for the turboprop caused it to spurn jet development for too long.

Raytheon, which acquired the company in 1980, attempted to leapfrog competing jets by introducing in 1986 what it hoped would be the ultimate business aircraft, the Starship—a twin pusher turboprop with a canard forward, main wing aft and made of composites. But Starship was star-crossed. Deemed too heavy, too slow, too expensive and too ugly, the market flatly rejected it.

That expensive experience—the company put the program loss at $500 million, but insiders say it cost considerably more—chastened Raytheon. Rather than launch any all-new programs, it acquired rights to the Diamond II, a Mitsubishi business jet of unremarkable performance, which it began building in Wichita in 1988. Then in 1993, it acquired the 30-year-old Hawker program. While the company has made significant improvements to all models, only the King Airs are market leaders.

When once again it set out with clean-sheet designs for the Premier light jet in 1995 and the top-of-the-line Horizon the following year, it stumbled badly to the finish line. Certified in 2001, the Premier was a modest performer. And work on the Horizon, since renamed Hawker 4000, consumed a decade to win full certification, and by then other super-midsize jets had stormed the market.

So, Hawker Beechcraft finds itself with products seen by many as too old or non-competitive.

And while the T–6 has been a stellar product, the original 700+ aircraft order from the U.S. Navy and Air Force is nearly fulfilled, with no other large-scale buyer on the horizon. Meanwhile, a flap over a competition between the AT–6 and Embraer's Super Tucano for an Air Force-led contract (see article below) prompted Hawker Beechcraft to file a lawsuit, embarrassing the service.

Hawker Beechcraft says Superior would be "investing substantial capital in the company." If so, its backers best have deep pockets, strong stomachs and patience aplenty.

Pelton says upgrading or developing a new aircraft can cost $180–700 million or more and that Hawker Beechcraft will require several such infusions because "long term, they'll still be in a spiral unless they invest."

The company returns to bankruptcy court July 17 to request permission to pursue the Superior deal. The way forward will become clearer after that, but not the ultimate outcome.

Notes Pelton, "We're not going to know what this chapter looks like for another three to four years."

With Bradley Perrett in Beijing; Fred George and Jen DiMascio in Farnborough; and Dave Fulghum in Washington.

http://www.aviationweek.com/Article/PrintArticle.aspx?id=/article-xml/AW__07__16__2012__p40-476128.xml&p=1&printView=true

Senator CANTWELL. Good. Thank you.

All right. Dr. Tracy, you're up. Speak into the microphone, and if the panelists could just note there's a little signal there to signify 5 minutes on your comments, and we have your full written testimony. But, again, welcome. Thank you for being here.

STATEMENT OF DR. JOHN TRACY, CHIEF TECHNOLOGY OFFICER AND SENIOR VICE PRESIDENT, ENGINEERING, OPERATIONS AND TECHNOLOGY, THE BOEING COMPANY

Dr. TRACY. Thank you. Good afternoon, 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's a privilege to be a participant on this panel and provide Boeing's view on the challenges faced by America's aviation industry.

Boeing is proud to be one of the leading U.S. exporters of manufactured goods. Our spirit of technical achievement and the breakthrough of products and services exemplify why the United States holds the role as the global leader in aviation. This leadership role is important to the United States and its workforce.

Aviation helps drive our economy, contributes $1.3 trillion annually in economic activity, and generates 10.2 million jobs. And so it's no surprise that international competition for this market is growing. We are grateful for the support of Members of Congress on both sides of the aisle in seeking an even playing field for global aviation commerce.

At Boeing, we are continuing to hire. As of May 31, we had 173,167 employees, an increase of almost 11 percent from 5 years ago. Boeing, along with other high-tech companies, faces a shortage of skills, not labor. Simply put, we need more young Americans to pursue education and careers in STEM related fields. In 2011, Boeing invested about $35 million externally in education programs with about $27 million directed toward specific STEM programs to inspire engineers, scientists, and technologists of tomorrow.

To maintain the United States' leadership, companies in our industry also execute a vigorous slate of research and development activities. Boeing, for example, spent $3.9 billion in R&D in 2011. But it's basic scientific research supported by Federal investment that lays the foundation for the jobs of tomorrow.

Another area of innovation is the need to improve the U.S. air traffic management system. The current air traffic control system, while safe, is inefficient. The good news is that there is broad agreement on what needs to be done. We are grateful for the efforts of this committee to include in the most recent FAA reauthorization strong accountability measures and a path forward for NextGen acceleration.

We recognize that Congress faces the difficult task of ensuring that Federal expenditures address our nation's financial obligations and generate the greatest benefit for the American people. To ensure our competitiveness in the global marketplace, our aviation industry needs topnotch infrastructure, robust R&D programs, and a well-educated workforce.

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

[The prepared statement of Dr. Tracy follows:]

PREPARED STATEMENT OF DR. JOHN TRACY, CHIEF TECHNOLOGY OFFICER AND SENIOR VICE PRESIDENT, ENGINEERING, OPERATIONS AND TECHNOLOGY, THE BOEING COMPANY

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.

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.

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.

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 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 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 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 CO_2 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 CO_2) in aviation's environmental impact by enabling airplanes to save up to 1,100 pounds of fuel—and up to 3,400 pounds of CO_2—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 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.

Senator CANTWELL. Thank you, Dr. Tracy. Thank you for your testimony. And we look forward to asking some questions.

Mr. Elwell? Thank you.

STATEMENT OF DAN ELWELL, VICE PRESIDENT, CIVIL AVIATION, AEROSPACE INDUSTRIES ASSOCIATION

Mr. ELWELL. Thank you, Chairwoman Cantwell, Ranking Member Thune, and other distinguished members of the Subcommittee. My name is Dan Elwell, and I am the Vice President of Civil Aviation at the Aerospace Industries Association, the Nation's largest aerospace and defense manufacturing trade association.

We are an industry that consistently punches above its weight. In fact, the aerospace industry is our nation's largest net exporter, contributing over $40 billion a year to our trade balance. To keep our industry strong and well-positioned to compete globally today and tomorrow, we have to focus on three key areas: the certification process, as you mentioned; homegrown innovation; and maintaining a world class workforce.

The certification process. In its 2012 current market outlook, as you pointed out, Chairwoman, Boeing estimated the total number of commercial aircraft worldwide will double from approximately 20,000 today to 40,000 by 2031, and 34,000 of those aircraft will be new. Some will replace older, less fuel efficient aircraft, but almost 60 percent of the new airliners will accommodate global market growth, and over 80 percent of that growth will be outside the U.S.

Our industry has a wide range of aerospace products that are poised to enter the global marketplace, including unmanned aerial systems. As a regulated industry, bringing these new products to market requires FAA certification. However, in this fast-moving, globally competitive environment, we are finding that the FAA certification process simply moves too slowly.

That's why we're pleased that Congress recognized this issue in Section 312 of the FAA Modernization and Reform Act. This section, commonly referred to as certification streamlining, requires the FAA, in consultation with industry, to examine the certification and approval process and provide recommendations for streamlining and reengineering the process.

The Act requires the FAA to issue its report to Congress by mid August, 2012, and implement the recommendations by next February. We urge Congress to endorse the joint FAA-industry recommendations from the ARC and ask you to ensure FAA seeks further consultation with industry as it develops its implementation plan.

The second key focus is the need to promote aviation innovation at home. The United States has always been a world leader in aerospace research and design. That's why the R&D tax credit is so important for high-tech aerospace companies. But the R&D tax credit expired at the end of last year. So U.S. companies have been operating at a competitive disadvantage against companies in other nations with higher credits.

Here is a telling statistic. From 2005 to 2009, the number of U.S. companies with corporate-wide initiatives to outsource R&D related jobs exploded from 22 percent to over 50 percent. But who can blame them? For each R&D dollar invested in France, the government provides a tax credit of 42 cents. India and Brazil provide 25 and 27 cents. And what was our credit before it expired? Six cents. That placed us dead last in the OECD rankings.

R&D jobs are leaving the country, Madam Chair, and the competitive difference in R&D tax policy is the key factor. We urge Congress to restore the R&D tax credit and make it permanent as soon as possible.

Finally, to be globally competitive, we need a world class workforce. Although today, we are a highly skilled workforce that punches above its weight, there are ominous trends about our ability to stay in the ring. Today, we simply don't produce enough workers with the right education and technical skills to remain competitive.

With 30 percent of the aerospace workforce eligible to retire by 2016, the U.S. has got to step up its game. Ten years ago, the Commission on the Future of the U.S. Aerospace Industry recommended that the Nation immediately reverse the decline in and promote the growth of a scientifically and technologically trained U.S. aerospace workforce, and that the breakdown of America's intellectual and industrial capacity is a threat to national security and our capability to continue as a world leader.

Companies in our industry are working closely with community colleges to develop and support courses that prepare students for specific positions they have open. Community colleges and trade schools play a critical role in meeting our workforce needs. One-third of current STEM employees began their education in community colleges, and thousands of aviation jobs require technical skills but don't require four-year degrees. Madam Chair, your leadership in this area is well known, and we applaud you for all you've done.

In conclusion, we believe that U.S. aviation manufacturers are in a strong competitive position. But there are risks to our maintaining this position over the next decade. As a nation, we need to ensure that our tax policies provide incentives to retain our R&D jobs, provide FAA the resources and support to improve its certification process, and ensure our aerospace workforce is prepared to meet the challenges over the next decade.

Thank you for the opportunity to testify.

[The prepared statement of Mr. Elwell follows:]

PREPARED STATEMENT OF DAN ELWELL, VICE PRESIDENT, CIVIL AVIATION, AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA

Introduction

Chairwoman Cantwell, Ranking Member Thune, and other distinguished members of the Subcommittee: The Aerospace Industries Association (AIA) appreciates the opportunity today to present our views on the competitiveness of the U.S. aviation industry. There is no sector of the U.S. economy more global than aviation, and as a result, the competition for this business is increasingly global as well.

My name is Dan Elwell, and I am the Vice President of Civil Aviation at AIA, the Nation's largest trade association representing aerospace and defense manufacturers. Our 350 members represent an industry that directly employs one million workers, and supports another 2.5 million jobs either indirectly or as suppliers. Of

this total, over 325,000 are involved in the manufacture of commercial and general aviation aircraft.

The aerospace industry is highly skilled, and as a result provides well-paying, stable middle class jobs all around the Nation. The average wage in our industry is approximately $80,000, almost twice the national average. The U.S. continues to be a world leader in aerospace manufacturing, due to the dedication and hard work of American workers and the executives who lead these companies. As we like to say, this is an industry that consistently "punches above its weight".

On balance, our aviation manufacturers today are highly competitive in the global marketplace. In fact, the aerospace industry is our Nation's largest net exporter, contributing over $40 billion a year to our trade balance. And by far the largest component of that figure involves commercial aircraft manufacturing.

Aircraft

Our aircraft manufacturers continue to hold strong positions in the world market because of technological advances and an extended record of performance. Jet aircraft fuel efficiency has improved by 70 percent the past four decades and by 20 percent in the past ten years. Aircraft safety margins have doubled since 1990. Advanced avionics allow these aircraft to fly more fuel-efficient routes at lower cost. Because of this, the global competitiveness of U.S. aircraft manufacturers remains strong.

Boeing has just released their 2012 Current Market Outlook, and I would like to highlight a couple of their findings. They predict strong growth over the next two decades, outpacing the growth in global GDP. This continues a trend we have seen for the past two or three decades. There were nearly 20,000 commercial aircraft in worldwide service in 2011. Boeing estimates that number will double by 2031 and 34,000 of those aircraft will be new. Some of these airplanes will replace older, less fuel-efficient aircraft, but almost 60 percent of the new airliners will be needed to accommodate global market growth. A disproportionate share of this growth involves smaller, single-aisle aircraft and emerging markets led by the Asia-Pacific region and China in particular.

Bombardier's 2012 Market Forecast focuses on the 20- to 149-seat market, and comes to similar conclusions. Global deliveries of smaller (20- to 59-seat) aircraft are expected to decline substantially over the next two decades, as airlines shift to larger, more economical regional aircraft in the 60-to 99-seat category. Once again, because aviation growth tends to follow national GDP growth and urbanization, the largest market growth is expected in China and the Asia-Pacific region, with Latin America not far behind. Bombardier estimates that, over the next twenty years, the worldwide share of middle-class consumer spending held by the United States and Europe will drop from 64 percent in 2009 to approximately 30 percent.

Honeywell's 2011 Business Aviation Outlook indicates the business jet market is recovering from the recent downturn, with orders expected to strengthen throughout 2013. Over the long-term this outlook is increasingly dependent on high economic growth rates in the developing world. However, for the next five years at least, the majority of orders are still expected to come from North America and dependent on the state of the U.S. economy.

The growth in emerging markets will naturally stimulate other nations to improve or establish their own aircraft manufacturing capabilities. Manufacturers in Latin America, Russia, China, and elsewhere will increasingly compete with U.S. industry, particularly in the high-growth markets for single-aisle aircraft and regional jets. Therefore, it is imperative that we address risks or barriers to our global competitiveness over the long-term.

Engines and Avionics

The competitiveness of our engines and avionics manufacturing is also critical for us to maintain a global edge. There are longstanding international competitors in this arena, and we must be vigilant to ensure U.S. companies remain the preferred vendors for our foreign customers. As our military budget is pressured here in the United States, it has a direct effect on the investment dollars companies have available to sustain and grow our industrial base. These industries are significant beneficiaries of research and development activity; their own and government research on the latest cutting-edge technologies that may one day be ready for the global marketplace. One example of an R&D program critical to the aviation industry is FAA's Continuous Low Emissions, Environment and Noise (CLEEN) program. This program is cost-shared with industry on a dollar-for-dollar basis and is making great strides in the development of new engine technologies that dramatically reduce aviation noise, emissions and fuel burn.

Barriers or Risks to Maintaining U.S. Competitiveness

While the U.S. is in a stable position today, there are risks and barriers that will undercut our position over the next few years if not addressed. These include FAA budget concerns, international leadership, tax incentives for the development of new technologies, and the inability to maintain a properly skilled workforce. Let me address each of those in turn.

Support from the Federal Aviation Administration

The Federal Aviation Administration provides important services that directly affect the competitiveness of U.S. aviation manufacturers. Our industry has a wide range of aerospace products that are poised to enter the global marketplace, including unmanned aerial systems. As a regulated industry, bringing these new products to the market requires FAA certification. However, in this fast-moving, globally competitive environment, we are finding that FAA's certification process simply moves too slowly.

We were pleased that Congress recognized this issue in section 312 of the FAA Modernization and Reform Act of 2012 (Public Law 112–95). This section, commonly referred to as "certification streamlining", requires the FAA to examine, in consultation with the aviation industry, the certification and approval process, and provide recommendations for streamlining and re-engineering the process. The Act requires FAA to issue its report to Congress by mid-August of 2012, and implement the recommendations by next February. We urge Congress to endorse the recommendations created by the joint FAA—Industry Aviation Rulemaking Committee (ARC). We also ask congress to ensure FAA seeks further consultation with industry as it develops an implementation plan.

The Act also authorizes the FAA, beginning January 1, 2013, to start to issue Certification Design and Production Organization (CPDO) certificates. Certified design organizations provide an ideal way for the FAA to leverage the experience and track record of manufacturers to handle the day-to-day certification activities, thereby allowing the FAA to focus tight resources on safety-critical trends and issues. This approach, now explicitly authorized and encouraged by Congress, is a positive and significant step toward further improving and streamlining today's certification process.

Industry understands that the FAA has regulatory responsibilities, and FAA certification is still the "gold standard" sought by aviation authorities throughout the world. However, with the worldwide market shifting to Asia and the developing world, it would be detrimental to our competitiveness if foreign manufacturers are able to move improved products into the marketplace more quickly. Simply put, the FAA needs to change its approach given today's realities. We urge the Congress to ensure that FAA follows through on the certification reforms in Public Law 112–95.

Secondly, it is imperative that FAA keep the Next Generation Air Transportation System (NextGen) on track and implement the NextGen-related provisions of the FAA Modernization Act. We understand that FAA is behind schedule in many of the initial deadlines established under the Act, and that authorized programs like the Avionics Equipage Incentive Program (Sec. 221) are running into opposition on legal and technical grounds.

Madam Chair, NextGen is clearly a partnership between government and industry. If airlines lack the incentive to equip or use NextGen, FAA's multi-billion dollar investment is largely wasted, and we lose the significant benefits that NextGen offers. Other nations are aggressively using third parties to develop performance-based approaches. Other nations are pursuing their own NextGen programs, and we cannot afford to fall behind. Again, we applaud this Committee for its leadership role in passing the NextGen-related provisions of the FAA Modernization Act. We hope the Committee will ensure that FAA works diligently and has the necessary resources to implement those provisions in a timely way.

Thirdly, the FAA Modernization Act provides important requirements and deadlines for the integration of Unmanned Aerial Systems (UASs) into our national airspace. The Act requires the FAA to establish up to six test sites where UAS technology and procedures can be tested and validated. It requires the agency to integrate UAS systems into the airspace no later than 2015. And it requires the development of a long-term UAS Roadmap. AIA is strongly supportive of these efforts, and believes they must remain on track. Our manufacturers believe UAS systems will constitute a significant global market over the coming years, and integration into our own airspace is a critical step to meeting our export potential in this emerging area of technology.

We are also concerned that the FAA may not have adequate budgetary resources to help the industry remain competitive. FAA's Certification Office received several

new responsibilities in the reauthorization Act, yet their budget remains flat. Future budget projections for NextGen have already been reduced by one-third from the estimates made a few years ago. These pose continuing challenges for the agency. But on top of these difficulties, sequestration could reduce the FAA's budget by $1 billion next January. The FAA has never faced a reduction of that magnitude, particularly three months into the Fiscal Year.

If sequestration goes into effect, we believe FAA would seek authority to protect most of the daily operations of the air traffic control system, at least at the major hub airports. This means that NextGen would have to bear a heavier share of the reductions. If the FAA were to split the reductions equally between their capital and operation accounts, NextGen could see its budget reduced by one-half (from $1 billion to $500 million). We believe this would cause such chaos in the overall program that it would take years, if not decades, to recover.

Such dramatic setbacks, if allowed to occur, would embolden our overseas competitors, disillusion our industry, and tell the developing world that the U.S. may not be able to meet aviation's needs in the future. That is the wrong message to send.

International Leadership

Because aviation is fundamentally global, it is critical that the U.S. maintain its leadership role in the international bodies that set standards and harmonize technical specifications for aviation technologies. It is not unusual for technical or policy differences to arise among nations and regions of the world on aviation matters. For example, the recent episodes of volcanic ash over the European continent led to differences of opinion about our ability to detect and gauge the effects of microscopic ash particles on an aircraft engine. More recently, we have experienced the European Union's desire to impose emissions trading charges on the world's air carriers out of a misguided desire to move more forcefully on the issue of aircraft emissions.

In cases like these, the United States must maintain its presence and reputation in the international arena, particularly in the future as market dynamics shift to emerging nations. As these nations and their industries grow, they will expect a stronger voice in international technical and policy discussions, and the U.S. must maintain a leadership role in the face of those shifts. In air traffic control technology, for example, if the U.S. falls behind other nations, it will be more difficult to harmonize our systems with those being developed in Europe, Asia, and other regions of the world. This could be a serious problem for our aircraft, engine and avionics manufacturers, who need to provide systems capable of interacting with ATC infrastructure throughout the world.

R&D Tax Credit

The Research and Experimentation Tax Credit (commonly called "R&D Tax Credit") is an important incentive for national business investment in R&D, but it is especially important for high-tech companies in the aerospace sector. Since the credit expired at the end of last year, U.S. companies have been operating at a disadvantage against companies in other nations who have higher R&D tax credits available to them.

The OECD analyzed this subject in 2010, and found that the U.S. now trails many nations in the tax treatment of research and development expenses. For each dollar of R&D invested in France, the government provides a tax credit of 42 cents. In Spain, the figure is 35 cents. India and Brazil provide between 25 and 27 cents. And even when our credit is in place, how much help does it provide? Only 6 cents. That placed us dead last in the OECD ranking.

At a time when the United States needs to retain and increase jobs, the R&D tax credit could assist immediately in achieving that goal. In 2009, more than 50 percent of U.S. companies indicated they had corporate-wide initiatives to outsource innovation jobs. Four years earlier, that figure had been only 22 percent. R&D jobs are leaving the United States, Madam Chair, and the competitive difference in R&D tax policy is one key factor. We urge the Congress to restore the R&D tax credit as soon as possible.

Providing a Skilled Aerospace Workforce

American aerospace workers are among the most highly productive, highly skilled workers in the world. With a global market that is growing rapidly, and a U.S. industry that dominates the export market, we must maintain an adequate supply of workers with degrees in science, technology, engineering and math (STEM) disciplines and with specific manufacturing skills. And today, everyone in the workplace must be STEM-literate to function productively. However, there are ominous trends about our ability to maintain this workforce into the future.

Today, we are simply not producing enough workers with the right education and technical skills to remain competitive. The U.S. currently graduates approximately 300,000 students a year with bachelors or associate degrees in STEM fields. The February 2012 report of the President's Council of Advisors on Science and Technology (PCAST) recommended that this be raised by one-third to meet our economic needs. One startling fact is that less than 40 percent of students who start college intending to earn a STEM degree actually complete the degree requirements.

And of course community colleges and trade schools also play a critical role in meeting our workforce needs. One-third of current STEM employees began their education in community colleges. And thousands of aviation jobs require technical skills, but do not require a four year degree. Companies in our industry are working closely with community colleges to develop and support curriculum to prepare students for specific positions they have open. Madam chair, your leadership in this area is well known and we applaud you for all you are doing.

The workforce issue is all the more pronounced because the aerospace industry has a high percentage of employees that are eligible to retire over the next decade. In 2011, over 60 percent of the U.S. aerospace workforce was 45 or older. This year 17 percent of aerospace workers are already eligible to retire and by 2016 that proportion will exceed 30 percent. We need more STEM workers today, but when this bow wave of retirements hits us, we could start to lose our edge.

The Commission on the Future of the U.S. Aerospace Industry recommended ten years ago "that the Nation immediately reverse the decline in and promote the growth of a scientifically and technologically trained U.S. aerospace workforce" adding that "the breakdown of America's intellectual and industrial capacity is a threat to national security and our capability to continue as a world leader." The world's emerging economies are rapidly improving their abilities to provide skilled workforces in STEM fields and in manufacturing. If we are unable to match this growth, we will fall behind.

As a trade association, AIA has been actively engaged in this issue for a number of years. In 2010, AIA spearheaded the formation of the Business and Industry STEM Education Coalition—a coalition of coalitions—to provide a unified voice for those who employ STEM professionals. AIA and BISEC work with academia, government, the philanthropic community, school systems, STEM program providers and others at the national, state and local levels. We are engaging with and helping advance state STEM networks that are emerging across the country. For example, just last week we convened a meeting in Renton with Washington STEM that was attended by 150 leaders. Later this year we will hold similar meetings in Tennessee and California.

Export Policy

AIA strongly supports the goal of the National Export Initiative to double U.S. exports by the year 2014. One example of where this is working in aviation is the NextGen Vendors Group (NVG), a public-private partnership between the Department of Commerce and AIA. Earlier this year, the NVG provided opportunities for U.S. vendors to discuss requirements with foreign air navigation service providers in Amsterdam, Netherlands at ATC Global, and a similar effort will be held for the Latin America-Caribbean region later in 2012. The NVG is a great example of how the National Export Initiative can be put to use to help U.S. aviation manufacturers. We encourage the Department of Commerce to increase its support for the NVG and other efforts to promote aviation exports.

Conclusion

In conclusion, we believe that U.S. aviation manufacturers are in a strong competitive position today, but there are risks to our maintaining this position over the next decade. As a nation, we need to ensure that our tax policies provide incentives to maintain R&D jobs here in the United States and are competitive with the policies of other nations. We need to provide improved infrastructure in air traffic control technology, not only for our own economic health but for its export potential. And we need to ensure that our aerospace workforce is prepared to handle the challenges and changes that are coming to the global marketplace over the next decade or two. Thank you for the opportunity to testify, and I would be happy to answer any questions you may have.

Senator CANTWELL. Thank you, Mr. Elwell. And, certainly, we'll look forward to asking you some questions about that certification process in more detail.

Mr. Sorscher, thank you very much for being here.

STATEMENT OF DR. STANLEY SORSCHER, SOCIETY OF PROFESSIONAL ENGINEERING EMPLOYEES IN AEROSPACE, INTERNATIONAL FEDERATION OF PROFESSIONAL AND TECHNICAL ENGINEERS LOCAL 2001

Mr. SORSCHER. Thank you, Madam Chairman and members of the Committee, for holding this hearing on this important issue. My name is Stan Sorscher. I am Labor Representative for the Society for Professional Engineering Employees in Aerospace. That's a union that represents engineers, scientists, pilots, technical and professional employees.

I submitted written testimony, and I'd like to highlight a couple of points from the written testimony. First, we absolutely agree with concerns about the aging workforce. It then becomes our challenge to attract young people and students to go into aerospace careers, and we need to retain experienced mid-career employees.

Families make a once-in-a-lifetime investment in their children's education, and any industry, any occupation, needs to send a market signal to families and students that this will be an attractive career. We also need to inspire students who have the option of going into other careers where they can get a sense of accomplishment. So that's sort of the promise of a career that we're making to students and workers.

We need to deliver on the promise of good jobs and good careers, having made the promise. Engineers like to solve their little piece of a larger problem, but they also think systemically of the larger problem that their piece fits into. So what works, and how does it work?

When you look at aerospace, specifically, as an industry, aerospace is a tough business on its best day. And the sense from the workplace is that the secret to success in our business is a strong problem-solving, design, and manufacturing culture—so a strong problem-solving culture in the design and manufacturing communities.

In our written testimony, we have some policy suggestions. Any policy operates in a larger context. In this case, the context would be globalization and integration with the global economy. Globalization fundamentally reduces our national identity. We hear about global products. We hear about global companies. We hear about global supply chains.

We're here in this hearing to talk about maintaining U.S. leadership in this industry. Sustainable U.S. leadership means a strong domestic industrial base. So, again, the engineer would ask, "What works, and how does this work?"

A systematic approach we're comfortable with—a systematic approach would be a national manufacturing industrial strategy. So what we would look for in such a national strategy would be, again, to encourage this problem-solving culture, which is particularly difficult in a global economy, and investment in the domestic industrial base. And, again, we hear how difficult that is in the global economy.

I was on the Hill one day, and I heard about a Congressman who was going through legislation, who was marking up legislation, and he was writing "in America, in America, in America." It's kind of a funny joke, right, and we can say it in different ways. But a suc-

cessful manufacturing strategy for America does close that loop and add, you know, "in America" to the end of the sentence. So, again, that's what we'd be looking for.

[The prepared statement of Mr. Sorscher follows:]

PREPARED STATEMENT OF DR. STANLEY SORSCHER, SOCIETY OF PROFESSIONAL ENGINEERING EMPLOYEES IN AEROSPACE, INTERNATIONAL FEDERATION OF PROFESSIONAL AND TECHNICAL ENGINEERS LOCAL 2001

Thank you Madam Chairman and members of the Committee for bringing attention to competition issues in the aerospace industry.

My name is Stan Sorscher. I am on staff at the Society of Professional Engineering Employees Association (SPEEA), a labor union representing over 24,000 engineers, scientists, pilots, technical and professional employees in the aerospace industry.

We share concerns of other industry stakeholders regarding our aging workforce, knowledge transfer, and our capacity to deliver the next generation of workers. We agree that we face challenges attracting talented students and retaining skilled workers who currently contribute to the success of the aerospace industry.

From our perspective, this challenge has two basic elements. First, we need to offer students, families and workers a sense that aerospace can give them a career, with some sense of job security. This is a fundamental market signal that any occupation needs to send.

The second element arguably applies more to aerospace than to other industries.

Aerospace products are complex and heavily engineered. This industry is known for its very demanding development programs, followed by steep learning curves. This gives a competitive advantage to employers who have capable and effective engineering and manufacturing communities with strong problem-solving cultures. I think anyone who has worked in an aerospace development program can appreciate that assertion, without meaning any disrespect to hard-working and very productive workers in other industries.

Public policy plays a key role in addressing these issues and ensuring industry demands match the interests of students and workers.

In terms of the national labor market, that means employer-and government-supported training opportunities for interns, new hires, mid-career mobility, and transition from military to civilian work. We need to manage knowledge transfer from one generation of workers to the next.

We have considerable policy leverage through education and training programs, publicly funded research and development, investment in air traffic control, airport infrastructure, airplane certification, and our approach to safety.

Globalization has changed the workforce model

In recent decades, both aerospace manufacturing and airline service operations moved from integrated business models, to more fragmented or decentralized business models that rely heavily on global supplier networks.

We often hear a business perspective, that many activities are becoming more commodity-like, more cost-driven, and less performance-driven. Commodity-like activities can be outsourced locally or globally.

This reflects directly into our workforce strategies. A performance-driven company often holds its competitive advantage as a body of knowledge in a skilled and capable workforce. This type of company typically invests in worker training, knowledge transfer and lifelong learning.

Companies in commodity-like markets typically rely more on market relationships, and a broad supplier network. Competition turns on cost and delivery. In this business model, a firm draws labor from the external labor market, as needed.

When we talk with investors and financial analysts, they point to industries that successfully dismantled their integrated design and manufacturing communities. They cite running shoes, ladies garments, cell phones, hard drives, the motion picture industry and others. Some of these industries make products that are complex, highly technical, and creative.

We argue, "Aerospace is different." The 787 development program reminds us that aerospace manufacturing is still performance-driven. We can take similar lessons from the NextGen Air Traffic Control system, any number of military and space programs, the border fence project, or many other complex heavily engineered products in our industry. Our business is very difficult, on its best day.

Workforce strategies

We would design one set of policies for workforce development, education and training for a mature commodity-like industry, but different workforce policies entirely, when our industry is performance-driven. Leading firms will attract and retain skilled workers if they believe their competitive advantage is held as a body of knowledge in their workforce. Employers will use different workforce strategies if they think workers are largely interchangeable in a global labor market. In the transition from integrated to decentralized global business models, training costs are typically externalized to employees and the public.

Demographic problem

In the mid-90s aerospace employers began dismantling the integrated design and manufacturing communities. Figure 1 gives one instance of the aging workforce problem. Around 1990, a very large group of young engineers was hired for the 777 airplane program. Over the course of that program, older experienced workers transferred knowledge to the younger ones. In practice, this involved building a network of relationships, exchanging informal information, and establishing trust and confidence at the technical level. This is how a great deal of essential coordination takes place.

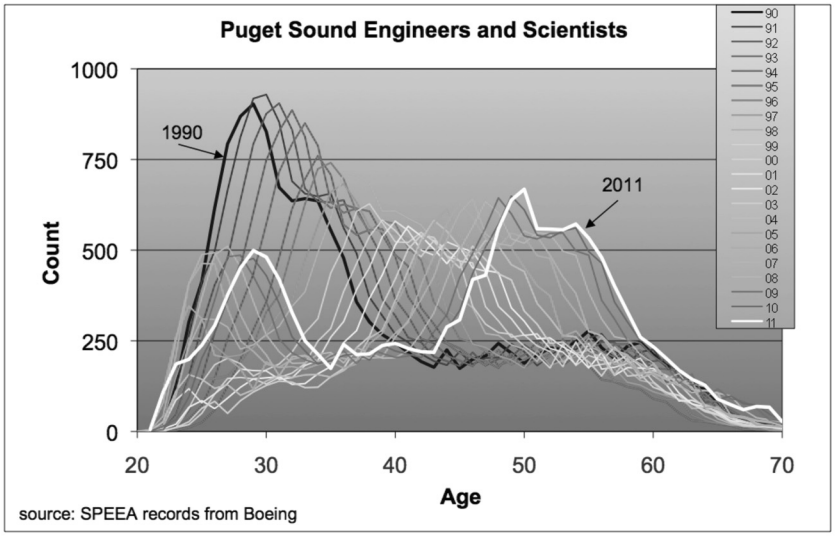

Figure 1. Demographic shift from 1990 to 2011 for engineers and scientists.

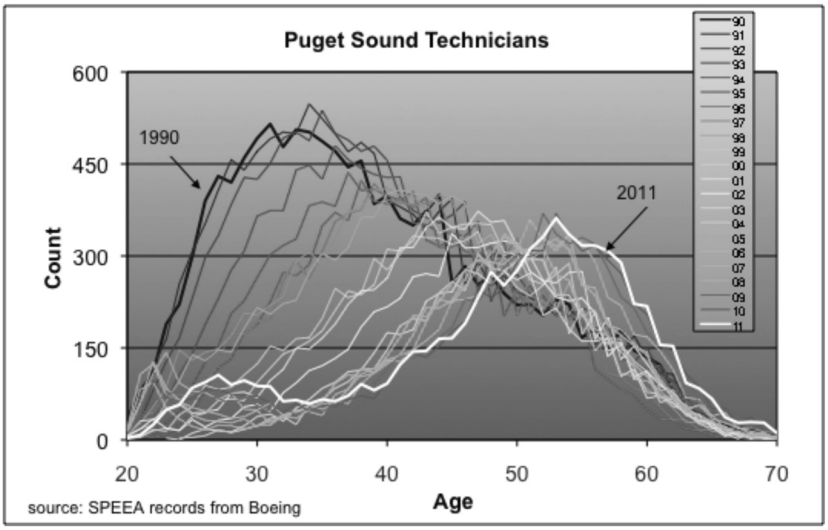

Figure 2. Demographic shift from 1990 to 2011 for technical workers.

That cohort of employees is now in their mid-fifties—within a few years of eligibility for early retirement at age 55. Very few engineers work to full retirement age of 65.

Figure 2 applies to technical workers, such as drafters, planners, laboratory technicians, and inspectors. The demographic bow-wave for technical employees is more dire.

Since the 90s, hiring has been weaker, and successive rounds of layoffs fell mostly to younger workers. In a sense, the aging workforce problem is one of our own making, driven by changes in business models.

Similar demographic patterns apply to hourly aerospace workers, and NASA scientists. European unions tell us that the Airbus workforce has similar demographics.

Trade and investment policies

Our national trade and investment policies encourage global economic integration, rather than specialization, contrary to predictions from classical trade theory. Integrating with the global economy is consistent with commodity-like products, but misses the mark when products are performance-driven.

We should think in terms of a national manufacturing strategy. Every country in the world has a manufacturing strategy. By definition, a national manufacturing strategy should express our national identity, rather than a global identity.

Workforce data as a policy-management tool

Regarding workforce, we are in the curious position where employers report that they can't find experienced workers, but new graduates can't find jobs in their field of study.

If we expect students and their families to invest in aerospace careers, we need to reassure them about the transition from education to employment. Tracking students as they enter the workforce would give us a valuable policy-management tool. When students graduate from community college programs, or engineering schools, or certificate programs, how many find jobs in their field of study? How many stay in their occupation or industry or geographic region for one year or for five years?

Canada, Australia, and the U.K. track their workforce and education programs in more detail than we do. This gives their policy-makers reliable data to understand where labor shortages occur, how many workers they will need, in what occupations, and for how long. Most large firms manage their internal labor markets with the best data available. We should make policy decisions based on credible, meaningful, and actionable data.

We are working with state agencies to assess the feasibility of connecting educational records to employment records. Some of their work was funded through the

stimulus package. Schools tell us they want this type of data. Some schools track their own statistics, but they work in isolation, on an *ad hoc* basis.

After we make our public investment in education and training, we should expect a reciprocal commitment from industry to hire graduates of these programs, and capitalize on our investment in human capital.

Mid-career Training

Many mid-career training programs are offered as part of a social safety net, after layoffs are announced. Mid-career training for employees who are not at risk can be a competitive edge. We also see demand for training programs for the mid-career transition from military to private employment.

Temporary Work Visas

Families and students are making "once-in-a-lifetime" investments in education and career choices. We send our students mixed signals when we raise the costs and risks of going to school, then tell the graduates to compete for entry level jobs with 800,000 foreign temporary high-tech workers, for careers with doubtful job security, in industries that are steadily shrinking as a percentage of GDP. We should not short-circuit our students' labor market when they graduate from school.

Connection between education and employment

Apprenticeship programs answer the education-to-employment question directly, since an employment relationship is built into apprenticeships, by definition.

Boeing and other large employers have excellent paid internship programs with good track records of recruiting and retaining students. They also offer excellent life-long learning programs. We should encourage and extend these programs.

SPEEA has proposed that publicly funded research and development include provisions for co-ops or collaborations, so that research students are exposed to work environments in the private sector. Students would gain an advantage in hiring, and this would help anchor intellectual property in the domestic economy.

We should revisit the Bayh-Dole Act, which releases any public interest in new intellectual property to universities and other agents for commercialization of publicly funded research. We support R&D as a way to create good jobs in America. As it works today, the Bayh-Dole Act emphasizes commercialization of new intellectual property, which is fine. However, we don't finish the sentence by saying "in America." We should update the Bayh-Dole act to close that loop, adding "in America," figuratively, at the end the sentence.

Policies for maintenance and airline operation

We cannot neglect national investments in air traffic control, airport infrastructure, airplane certification, and safety programs. One lesson we are learning is that to manage global operations for manufacturing, maintenance, certification and safety, we need close awareness and a minimum level of technical coordination. We cannot rely entirely on contractual arrangements or formal agreements.

These are complex technical issues. Private sector firms and public agencies need capable technical workforces and strong problem-solving cultures to manage these issues effectively.

Senator CANTWELL. Thank you, Mr. Sorscher.

Mr. Bunce, thank you for being here.

STATEMENT OF PETE BUNCE, PRESIDENT AND CEO, GENERAL AVIATION MANUFACTURERS ASSOCIATION

Mr. BUNCE. Madam Chairman, GAMA represents over 75 general aviation manufacturers, everything from the Boeing business jet down to light piston aircraft, rotorcraft, engine manufacturers, and avionics manufacturers. So, to us, this hearing is quite important, because when we talk about the international competitiveness of this industry, a lot of it has to do with things that this committee directly affects, and that's the government bureaucracy with which we have to work with to get product to market.

We're very appreciative of everything that this committee has done, particularly in the recent FAA reauthorization bill. Your emphasis on holding the FAA accountable for streamlining certification, the whole process, for consistency of regulatory interpreta-

tion, getting new approach procedures out, and providing metrics back to you on where we are with NextGen and how much improvement as we move forward will happen as we start to proliferate these systems into the national aerospace system is very, very important.

When we look at what our challenges are—my colleague from AIA, Mr. Elwell, already mentioned the importance of certification. Right now, the backup for some of our companies exceeds 18 months. That's 18 months before the FAA will even consider starting your project. What does that result in?

First of all, some companies that do have facilities in other nations are going to them to be able to get their products certified. But what happens to the company that doesn't have facilities in other nations that can't go and use that route? They sit there. And what that does is it keeps them from employing other Americans to be able to get those products to market.

This is a significant problem for us, and the streamlining is vitally important. And we hope that this committee and your colleagues over in the House hold the FAA accountable in this report that they get back to you on the success of streamlining and also the consistency of regulatory interpretation.

Equally important is why would a customer buy a product that has an FAA certification if they can't get it maintained overseas, particularly when our overseas markets are really the area for growth right now. About 10 years ago, this committee tasked the Department of Homeland Security to put forward a repair station security rule. They still haven't done it. There is no controversy over this rule. They just won't get it out.

And what that has done is in about 2007, the FAA was told they can't issue any companies an authorization to be able to repair FAA-certified aircraft overseas. We can't open up any new facilities. So that significantly impacts our ability to hire more people. So if I could ask anything, if we can up the pressure on the Department of Homeland Security to get this rule finished, it will help our manufacturers tremendously and create jobs.

On the environment, we're making some great strides on alternative fuels. We're transitioning the piston fleet to an unleaded avgas. Those are significant programs that we need to keep up. But we also need to keep the pressure on NextGen, because all of this discussion over ETS and everything that's happening over in Europe, in my opinion, is a smoke screen for their inability to be able to go and work with us to be able to advance NextGen, because if they got their airspace system aligned and were able to go and get the countries to work together in this Single European Skies initiative, which is right now greatly stalled, they would make the most environmental gains.

For us, not only in general aviation, but in the civil aviation sector, making these environmental gains with these new approach designs, being able to fly these precise approaches, and being able to come down to altitude with a continuous descent and ascent, is very important to making these environmental gains.

And, finally, as my colleagues have mentioned, on the workforce training, first of all, I'm very proud in the general aviation sector that our manufacturers have been very aggressive in hiring vet-

erans out there. Some of our companies have tremendous initiatives going forward and have been highlighted within their states as being some of the most veteran friendly employers around. That needs to continue.

But we also need to get at these young people early. Next week, we have an opportunity up in Oshkosh, Wisconsin. Our member companies are involved in "Teacher Day," where we go and try to teach them to be able to use the resources that the government provides to teach aviation principles in all of the STEM disciplines.

We also strongly support Build-a-Plane, where we take airplanes that are no longer in service, put them in high schools, and let people get their hands on them, because just as important as pilots are and engineers are, we need the mechanics out there. And that workforce is aging tremendously, so being able to get them to get their hands on aircraft and really get excited about this industry, which is a truly tremendous one, is very important to us.

So I just want to conclude. Again, thank you for the tremendous support that this committee has done for our industry. And we hope that we can keep the pressure on the FAA to make the gains that you've called for.

Thank you.

[The prepared statement of Mr. Bunce follows:]

PREPARED STATEMENT OF PETE BUNCE, PRESIDENT AND CEO, GENERAL AVIATION MANUFACTURERS ASSOCIATION

Introduction

Chairman Cantwell, Ranking Member Thune, distinguished members of the Subcommittee; my name is Pete Bunce and I am the President and CEO of the General Aviation Manufacturers Association (GAMA). GAMA represents over 75 companies who are the world's leading manufacturers of general aviation airplanes, rotorcraft, engines, avionics, and components. Our member companies also operate airplane fleets, airport fixed-based operations, as well as pilot training and maintenance facilities worldwide.

Thank you for convening this hearing and providing me the opportunity to testify on the global competitiveness of the U.S. aviation sector.

The General Aviation Marketplace

General aviation (GA) is an essential part of the national transportation system in the United States and in many countries around the world. It is especially critical for individuals and businesses that need to travel and move goods quickly and efficiently in today's just-in-time market. It is also a necessity for rural communities that do not have commercial air service.

Equally important, GA is a significant contributor to economies around the world. For example, in the United States, GA supports over 1.2 million jobs, provides $150 billion[1] in economic activity and, in 2010, generated $4.6 billion[2] in exports of domestically manufactured airplanes. It is also one of the few manufacturing industries providing a positive balance of trade for the United States. Many of these jobs are highly skilled, well paid positions and our companies are located throughout this nation: from Seattle to Albuquerque, Wichita to Little Rock, Cedar Rapids to Savannah.

Since the 2008 recession, the global general aviation manufacturing industry has experienced a real and substantial decline in airplane sales. The recent peak of 4,276 deliveries in 2007 was followed by a decline to 1,942 airplane deliveries in 2011 for the same set of companies.[3] The most drastic decline is for small, piston engine aircraft which have declined from 2,755 to 886 units in 2011, a reduction

[1] *General Aviation Contribution to the U.S. Economy,* Merge Global, 2006.
[2] *2011General Aviation Statistical Databook and Industry Outlook (amended),* GAMA, 2012.
[3] *Ibid.*

of 68 percent.[4] Employment figures at these companies reflect this decline with job losses in total for GAMA member companies at roughly 15 percent.

The North American market has dominated much of the history of general aviation through the mid-2000s when 75–80 percent of all GA aircraft deliveries were to U.S. or Canadian customers. Since then, the Europe, Asia Pacific and Latin America regions have become more important to the industry's manufacturers, suppliers and service companies. As an example, in 2011 only 50 percent of business jet deliveries went to North American customers while Europe accounted for 20.2 and Asia Pacific for 12.9 percent respectively in market share.[5] The Asia Pacific market share has tripled proportionally over the past five years for business jets.[6]

Moving Forward

These economic challenges and changing market dynamics have broad implications for the industry. Increasingly, U.S. manufacturers need to compete across the globe to maintain and strengthen sales, and have continued to invest and innovate. Many countries have indicated an interest in developing the general aviation industry both in terms of operations and manufacturing. Makers of U.S. engines and avionics and other components are strongly positioned in equipping both U.S. and aircraft manufactured in other countries. The business environment, already competitive and global in nature, has become even more complex. This requires the U.S. government and manufacturers to adapt and respond to marketplace changes and challenges. I want to applaud and thank the leadership of this Committee and others in Congress for responding to these challenges both in the FAA reauthorization bill, and in subsequent measures, but much remains to be done. The considerable effort by this Committee to pass the FAA bill was worth it for the changes it outlines that can benefit industry competitiveness but it is imperative that you continue to hold FAA accountable for implementing the changes outlined in the legislation.

Additionally, there are a number of areas regulators and policymakers need to focus on if our industry is to continue to recover and grow. Let me highlight several of these critical areas:

FAA Certification of New Products

Our companies cannot bring new product to market without FAA approval. We cannot overemphasize the importance of FAA certification to growth and sales in the global aviation industry. Unfortunately, FAA resources simply cannot keep up with the pace of industry activity and inefficiencies in FAA certification processes have led to missed business opportunities that restrict industry growth and have even led to missed business opportunities. FAA continues to employ a sequencing process where new products wait in line to even begin the certification process. Delays in beginning a certification project can range from one to eighteen months depending on the product and FAA's capacity to take on new work.

In addition, the lack of FAA engineering and technical resources necessary to support ongoing programs often results in delays and additional costs. The inability of FAA to support aircraft certification programs in a timely and efficient manner significantly impacts manufacturer and supplier company decisions to invest in new projects, expand facilities and increase employment. Not knowing when or even if the FAA can start a new certification project is a significant problem because these development programs require financial commitments and planning long before, sometimes even years before, a formal application is made to the FAA. This problem will become more acute as the need for FAA certification to support NextGen technologies and equipage increases. In addition, delays in FAA certification put U.S. manufacturers at a competitive disadvantage as foreign companies can obtain more efficient certification from their national authorities and get their products to market sooner.

We can address these delays through improvements in the effectiveness and efficiency of FAA certification processes. In the FAA Reauthorization process, Congress lent considerable support to these improvements such as effective use of delegation programs and increasing system safety oversight. We have been encouraged by Acting Administrator Huerta's responsiveness to this issue but similar efforts have eventually failed to realize their potential in the past. If the U.S. is to maintain leadership in the aviation industry and grow contributions to U.S. exports and jobs, both in the commercial and general aviation sector, we must ensure that FAA has

[4] *Ibid.*
[5] *Ibid.*
[6] *Ibid.*

adequate resources and that significant certification process improvements are implemented.

Impediments to our Presence Abroad—Foreign Repair Station Security

As exports grow and more of our companies and customers reside in every part of the world, the need for GAMA companies to maintain a strong service presence increases. Our manufacturers need the ability to have service and maintenance facilities where products are being sold. Today, there is a substantial impediment to being able to meet this objective.

For almost ten years, the Department of Homeland Security and Transportation Security Administration have failed to respond to a congressional requirement to promulgate aircraft repair station security regulations. In 2007, in an attempt to spur action by these agencies, Congress barred FAA from issuing new repair station certificates for overseas facilities until the rule is finalized. This has meant that as new markets develop, our companies have been hindered in opening facilities to support their products. This has made U.S. industry less responsive and less competitive as these opportunities emerge. Our companies stand ready to meet the security requirements—we just need to know what they are. We have appreciated those on this committee who have pushed for action by the Administration in finalizing the rule. Unfortunately, we continue to need strong engagement from Congress to ensure this rule is finalized as soon as possible.

Growing the Market Domestically and Internationally

As manufacturers try to take advantage of more markets, issues like aviation infrastructure, tax policy, airspace management, and relations with aviation regulators become even more important. It is critical for U.S. government and industry to advocate for policies that will help underpin aviation growth in the global environment.

In this regard, we strongly support the efforts of the Department of Transportation to develop an initiative with its partners in the Asia Pacific region to facilitate the operation of business aviation in these emerging economies. The U.S. Trade and Development Agency is also supporting this initiative through a "reverse trade" mission to bring aviation officials from six Asia Pacific economies to the U.S. later this year.

Despite this initiative, we remain concerned about the Administration's proposals regarding general aviation. Efforts to weaken our network of general aviation airports through funding cuts or by placing ill-advised user fees on the industry has negative ramifications for operators in the U.S. In addition, it sends a negative message to other governments and regulators as they work to expand their domestic markets. User fees have weakened general aviation in Europe and elsewhere and for the U.S. to be considering such proposals at a time when deliveries are already suffering is ill-advised. We have appreciated Congress consistently rejecting user fees because of the negative ramifications for communities, safety, and jobs.

International Leadership

Underlying the discussion about certification, repair stations, and market growth is the importance of U.S. leadership in global aviation safety. The ability for U.S. manufacturers to export aviation products to the global market depends directly upon FAA's international certification activities and agreements with foreign civil aviation authorities. The FAA and Department of Transportation (DOT) and other departments of government must step up their efforts if we are to grow exports in general and commercial aviation.

Furthermore, as markets develop overseas, the importance of FAA being able to work with other aviation regulatory bodies to adopt or at least accept U.S. safety standards and to develop bilateral safety arrangements to efficiently accept U.S. products becomes even more of a necessity. There is a great danger that support for these efforts will decline and this loss of FAA involvement in international aviation activities will hinder the development of safe and robust aviation transportation systems and the export of U.S. products and services. That is part of what is so concerning about the repair station security rule situation. As FAA is forced to sit on the sidelines because of DHS and TSA inaction, repair stations conducting work on non-FAA certified aircraft are able to receive certification from European or other authorities. These regulators are in a position to set global standards as new repair stations are certified in growing areas, creating an environment where FAA is diminished as a regulator.

We have also been puzzled by politically motivated attacks in the U.S. on our industry. If we are to maintain jobs and grow exports, we need a government that supports the dedicated men and women of our industry. These attacks hinder growth and send the wrong message in the U.S. and abroad regarding the benefits

of general aviation. The Administration needs to more consistently recognize the positive value of general and business aviation and work to support its recovery and growth.

Protecting the Environment

To ensure sustainable growth in the industry, general aviation manufacturers recognize we must take action to improve the environmental performance of the industry. Our industry has taken a leading role in the development of a CO_2 standard for new aircraft at the International Civil Aviation Organization (ICAO). GAMA member companies and others in the industry have in fact developed the first sector-specific carbon reduction commitments.[7] These commitments require considerable investment by manufacturers and others to reach our environmental goals. While there are many objections that can be leveled against the European Union's (EU) Emissions Trading Scheme (ETS), the most damning is that it takes resources away from the aviation industry that could best be invested by the industry into research or technologies that improve aircraft efficiency. We have very much appreciated Senator Thune and Senator McCaskill's leadership in introducing legislation against the EU ETS scheme and also Chairman Cantwell and others willingness to give the Administration the political support and tools necessary to push the EU to end its unilateral and misguided approach.

GAMA also supports efforts to develop alternative fuels by the United States military because we believe they will reduce the cost of these fuels and ultimately decrease our reliance on foreign oil. We are concerned about language in the National Defense Authorization Act that would restrict DOD's ability to move forward on biofuels. The work by the Department of Defense is being leveraged to move more quickly toward commercial viability of alternatives by demonstrating large scale production as well as making the price more competitive. This will help aviation industry meet its environmental commitments. Furthermore, we are convinced that this is an investment that will pay off by saving taxpayers millions through achieving energy security and independence while enhancing national security.

Sustaining the Workforce and Communities

To remain competitive, GAMA member companies undertake a range of activities to engage students from the elementary school level through college. Some companies run programs that take students from local community colleges and universities and offer them summer jobs and the promise of a job upon graduation. Many are also actively recruiting and hiring veterans due to their work ethic and unique skillset. We want to attract the best and the brightest to our industry.

A key domestic challenge will be to address the need for the United States to replace an aging science and engineering workforce. In addition, industry projects more than a million pilots and maintenance personnel will be needed to meet the demand of the worldwide aviation workplace in the next two decades. Following the recommendations of the Future of Aviation Advisory Committee set up by Secretary LaHood, we would encourage the Department of Transportation to develop and implement a strategic workforce development plan that includes Science, Technology, Engineering, and Mathematics (STEM) education programs and activities for the current and future workforce. Furthermore, the Interagency Aerospace Revitalization Task Force established in 2006 should be reinvigorated to coordinate Federal resources throughout the government to implement a national strategy to recruit, train, and cultivate a world class aerospace workforce.

As in workforce development, strong research and development programs are conducted by GAMA companies to ensure they remain competitive and can bring new technology and products to market. We support extending and making permanent the Research and Development Tax permanent to further these programs. This is the minimum that should be done given the U.S. was once a leader in encouraging research and development and we are now behind 23 other Organization for Economic Cooperation and Development (OECD) nations in providing research and development incentives to the private sector.

Conclusion

Chairman Cantwell, thank you for providing me the opportunity to discuss with the Subcommittee an overview of the competitiveness of the U.S. Aviation Industry. Our industry has faced many challenges in recent years but we believe that our in-

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[7] These commitments are: 1) carbon neutral growth by 2020; 2) an improvement in fuel efficiency of an average of 2 percent per year until 2020; and, 3) a reduction in CO_2 emissions of 50 percent by 2050 relative to 2005. GAMA press release of 11/24/09, at: (9/2/11) *http://www.gama.aero/media-center/press-releases/content/global-business-aviation-community-announces-commitment-climate-*

dustry will continue to recover and grow and we look forward to working with you, Senator Thune, and others on this subcommittee and in Congress to further general aviation manufacturing.

Thank you and I would be glad to answer any question that you may have.

Senator CANTWELL. Thank you, Mr. Bunce. Thank you for that testimony.

And, Mr. Calio, the man who represents the people who buy a lot of planes, we look forward to hearing your assessment of the industry.

STATEMENT OF NICHOLAS E. CALIO, PRESIDENT AND CHIEF EXECUTIVE OFFICER, AIRLINES FOR AMERICA (A4A)

Mr. CALIO. Thank you, Madam Chairwoman and members of the Committee, for the opportunity to be here today. A4A appreciates the opportunity to be here and also for all the work that you did to help get the FAA reauthorization bill passed this year, finally.

A4A represents the largest U.S. passenger and cargo carriers. We wish we could, as requested, address how to maintain our leadership or maintain leadership of the U.S. aviation sector. For U.S. airlines, our quest is to regain our leadership, not to maintain it.

For years, we've operated under a tax, regulatory, and infrastructure environment that has made it increasingly difficult to make a profit and to compete globally. As detailed in our written statement, airlines are not allowed to act freely as a business as other industries do. In the last 20 years, three or four Federal commissions have all studied the problems, recognized the same problems and made recommendations, virtually none of which have been acted upon in a comprehensive manner.

This needs to change if U.S. airlines are to be a driver of the valuation chain. Therefore, A4A is calling for the implementation of a national airline policy, a policy that we hope this committee will take a leadership role on executing.

The policy would have five core elements, the most important of which are to rationalize the airlines' tax burden, reform our regulatory structure, and modernize the infrastructure. It's critical that we act now. Aviation is a key driver of our economy. But while we have talked about the problems and failed to act, other governments, as you know, in Asia, the Middle East, and South America are treating their airlines as a strategic investment, successfully driving economic growth, jobs, and opportunity.

The results of this investment are startling. Currently, 9 out of every 10 wide-body jet orders have been placed by our foreign airline competitors. The Middle Eastern airlines alone have more wide-body jets on order than currently exist in the entire U.S. passenger fleet. And, as you know, it's the wide-body jets that generally fly the international routes.

The impacts are significant. Foreign flag carriers increasingly are flying to major U.S. gateways as a way to feed their growing global aviation hubs. These increases have already caused U.S. carriers to pull down capacity in some of these international markets, which is the most profitable part of the business and a part of the business that subsidizes, to a great degree, service to domestic routes, particularly service to smaller communities.

The domino effect of these reductions from international routes on critical local service is significant. Jurisdictions across the United States understand very well their local economies are hugely dependent on air service. Airlines enable local businesses to export goods, connect residents to the world for business and leisure travel, and to create good paying jobs.

We face the very real risk of U.S. airlines increasingly shifting to feeding foreign airlines at our gateways rather than expanding our own flying on international routes. It would be a costly shift for the entire industry and for our nation's economy. The risk goes to the very heart of today's hearing.

The aerospace industry is extraordinarily synergistic. When we're profitable, we purchase more planes and hire more people. You can look at last year, even with the meager profits we made the last couple of years. When we purchase more aircraft, it helps the airframe and engine manufacturers, as well as innumerable other businesses, including many high-tech firms and small businesses.

Our economy will only continue to become increasingly global as we move forward. And airlines will continue as the only mode of transportation that can efficiently move goods and people across the world on a timely basis. So we can continue on our path of ignoring the problems or in some cases exacerbating the problems and put the industry at risk of withering.

There is one example to follow and one example not to follow. The one not to follow is the U.S. maritime industry. Formerly the world leader, today it only carries 2 percent of the total world tonnage. On the other hand, in the 1970s and 1980s, Congress acted to put railroads on the path of profitability, able to sustain themselves, and today we are a world leader in the railroad industry.

We're at that same kind of tipping point now that the railroad industry faced and we view the national airline policy as a way going forward and we're committed to working with you on it. I would be remiss if I didn't thank members of this committee, particularly Senators Thune and McCaskill, for all their help on the EU Emissions Trading Scheme, which we view as an extra territorial tax grab that sets a bad example already being followed by many other areas and nations that can lead to no good. And we hope that the Senate will pass a bill and nudge the administration to act, because, clearly, if you talk to people at the EU level, diplomacy is not working.

Thank you very much.

[The prepared statement of Mr. Calio follows:]

PREPARED STATEMENT OF NICHOLAS E. CALIO, PRESIDENT AND CHIEF EXECUTIVE OFFICER, AIRLINES FOR AMERICA (A4A)

Introduction

U.S. airlines compete in a global market for passenger and cargo services. Free trade in the airline sector has grown to include over 100 countries whose airlines have unlimited rights to fly to any market in the United States. Government policy framing the U.S. airline industry, however, has not kept pace with this evolving market. Consequently, U.S. airlines enter the global field of competition at a significant disadvantage compared to their foreign competitors. That disadvantage adversely impacts profitability and growth for U.S. airlines, and all that goes with it—service to smaller communities, jobs, employee welfare and shareholder value, and it adversely impacts the broader value chain that supports the airline industry and

related travel and tourism industries. The aviation industry supports 10 million jobs and more than 5 percent of GDP. It could be an even bigger, more productive sector of the economy with the right policy framework.

The U.S. airline industry is a strategic asset. It is an enabler of the broader U.S. economy because it moves the commerce of the country. Simply put, it was the physical Internet before the digital Internet existed, and it remains the physical Internet for American business. U.S. airlines move manufactured goods from small communities across the country to other small communities, to major population centers within the U.S. and to cities and towns across the globe. The sales and service sectors rely on U.S. airlines to deliver their products and services and to meet their customers face-to-face. In the modern global market, U.S. businesses cannot compete without a healthy U.S. airline industry that provides convenient, safe and reasonably priced connectivity to their domestic and international markets and customers.

The same policies that disadvantage U.S. airlines, however, also disadvantage U.S. businesses and the broader economy. A weak U.S. airline industry means fewer flight options to fewer cities, particularly to foreign markets that are on the edge of profitability. Reduced service means greater challenges and fewer opportunities for U.S. businesses in the highly competitive global marketplace.

The solution to these linked problems is simple: adopting a National Airline Policy that provides a comprehensive blueprint to normalize the business environment in which U.S. airlines operate—a comprehensive airline policy that treats the industry like other U.S. industries and that enables U.S. airlines to compete effectively in the global marketplace. U.S. policy must recognize and treat the airline industry as a strategic asset. Failure to do so ultimately may see U.S. airlines increasingly shifting to feeding foreign-flag airlines at U.S. gateways, with significant adverse impact on profitability and on service that connects smaller cities and communities.

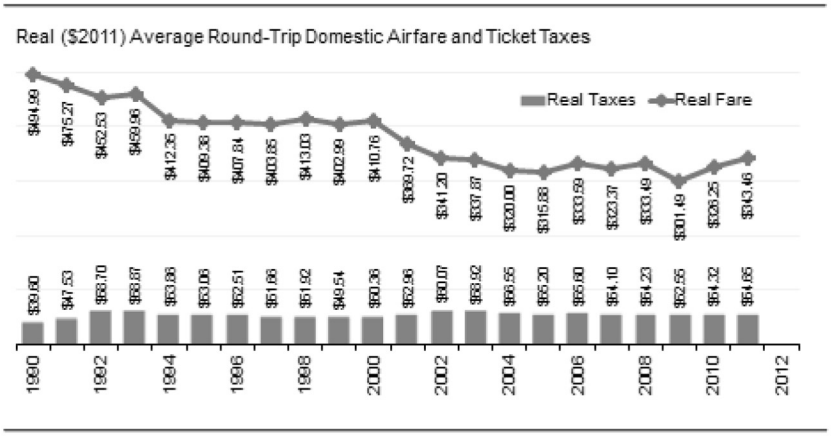
Policy Schizophrenia Prevails: Regulation and Tax Policies Undermine Deregulation Success

Congress deregulated the domestic airline industry in 1978 to unlock its value to the American public. Congress recognized that removing the strait-jacket of government regulation and allowing airlines to operate competitively like other businesses would make air transportation services affordable for consumers as well as foster innovation and efficiency for businesses.

Congress was right. Passenger and cargo airline services are a tremendous value for American businesses and consumers; they enable the U.S. economy. From 1990 to 2011, real domestic fares fell 31 percent. In contrast, taxes increased 38 percent. (Slide 1). Business travel and cargo movements have grown dramatically, and air service is the favored method of transporting valuable exports. In 2011, the value of U.S. exports by air was 117 times the value of exports transported by sea. (Slide 2). Commercial aviation has grown to become one of the most important drivers of U.S. GDP (Slide 3). Today, U.S. airlines carry approximately 2 million passengers and 50,000 tons of cargo daily on approximately 28,000 flights.

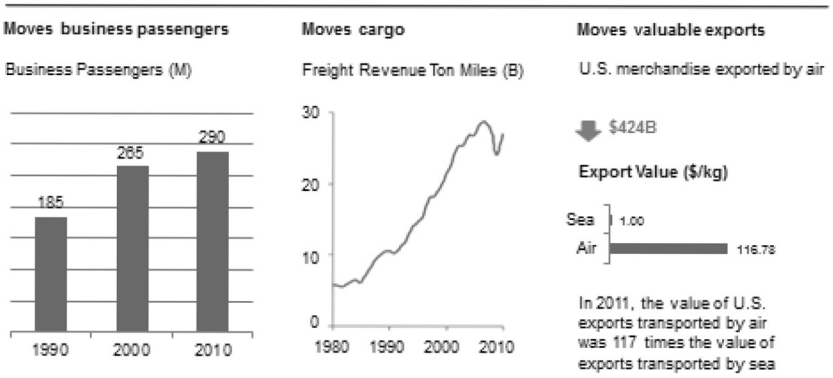
Slide 1

Real Domestic Fares Down 31 Percent Since 1990
Adjusted for Inflation, Domestic Ticket Taxes Up 38 Percent



Slide 2

Why Is a Comprehensive Airline Policy in the National Interest?
The U.S. Airline Industry Is a Critical Enabler of Commerce



Note: Passenger and freight data represent only scheduled service, and 2010 is estimated. Business passengers estimate based on assumption that 40 percent of air passengers travel for business.
Sources: BTS, T1, T-100 traffic data; Census Bureau, BCG analysis

Slide 3

Why Is a Comprehensive Airline Policy in the National Interest?

Example Industries, Pulled From GDP Rankings, to Demonstrate Relative GDP Value of The U.S. Airline Industry to These Selected Sectors

Note: Not intended to be a comprehensive ranking, example industries only to give a point of comparison.
Aviation-related data extrapolated from FAA economic impact report; aircraft and engine manufacturers include Boeing, GE, Pratt, Honeywell, Collins, etc.

Sources: BEA Industry accounts; Gambling and Spectator Sports from BEA Travel & Tourism satellite account data; FAA Air Traffic Organization, "The Economic Impact of Civil Aviation on the U.S. Economy" (Dec. 2009); BCG analysis

Despite the unparalleled value the U.S. airline industry delivers to the American economy as a result of deregulation, vestiges of the regulated era remain and new regulatory burdens have been added, particularly in recent years. These regulatory burdens reflect the ingrained view of some that the airline industry is different from other industries and, when controversy arises, regulation is the answer. This parochial view of commercial aviation must end.

Vestiges of economic regulation include *mandatory reporting* of: traffic data ("O&D" data); revenue and expense data; income taxes; maintenance expenses; profit and loss data; performance data such as on-time performance, baggage handling, and involuntarily denied boarding; and on-demand examination of financial data and records. Industries that were never regulated—the rental car and grocery industries, for example—are not saddled with these kinds of reporting burdens.

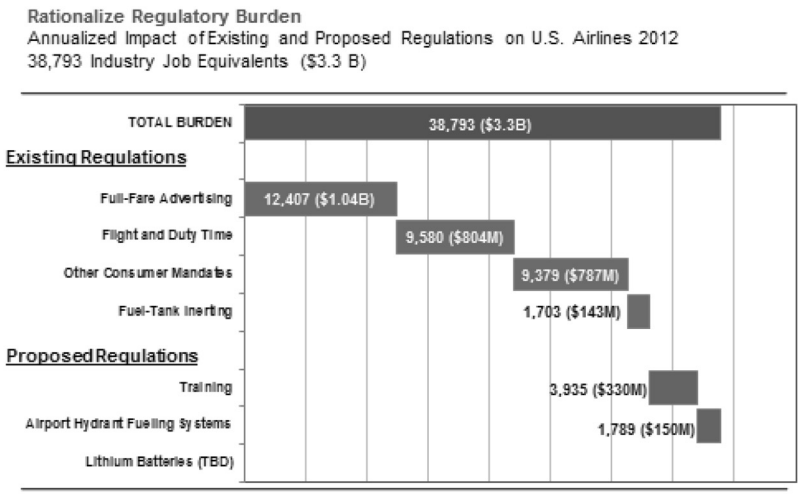
To make matters worse, the Department of Transportation (DOT) has proposed a rule that would require airlines to report new revenue information related to 19 separate items, including how much they collect for meals, drinks and upgrades. In addition, DOT is considering a rulemaking to "modernize" the O&D data it collects from airlines. The DOT proposal not only would greatly expand the financial and operational data elements it collects, it would also begin collecting personal identifying information from airline reservations systems—raising obvious and significant privacy concerns. Does Amtrak have to report to the government how much it made on selling Cokes, and how much revenue from tickets? Does the cable industry have to report how much it made selling HBO versus ESPN?

Likewise, more recent regulatory initiatives substitute the government's judgment for the working of the marketplace and manifest a philosophy that favors re-regulation over market discipline. These new regulatory burdens run counter to the Airline Deregulation Act, which specifically stated that market forces should determine and drive consumer options and services. The Department of Transportation's "Enhancing Airline Passenger Protections" Rule 2 (April 25, 2011) is such a rule. In it, DOT mandated that airlines, unlike virtually every other U.S. industry, must include taxes and mandatory fees in advertised prices. Even though airline customers purchase other products and services and understand that taxes and fees will be included in the final price, DOT insisted that airlines and travel agencies spend millions of dollars to reprogram their systems to display "full" prices. The rule also goes so far as to specify that any breakout of taxes, which are considerable, must be in smaller font than the total price. In addition, the rule creates an impossible burden by prohibiting an airline from raising the prices of optional on-board services for that particular customer after he/she purchases a ticket. That is like saying a ballpark or stadium cannot raise the price of a hotdog for an individual once he/she purchases a ticket. On game day, it is impossible for vendors to know what price to charge which patron if prices have changed. Although DOT has backed off of enforcing this rule, it has stated it will still be part of its next rulemaking.

Looking forward, DOT is planning a third "passenger protection" rule. Among other things, this rule would require airlines to make all of their products available through global distribution systems. In no other industry is this required. Are the passenger rail or cable industries *required by law* to turn over all of their products and services to a third-party duopoly that can then mark-up the products for their own financial gain?

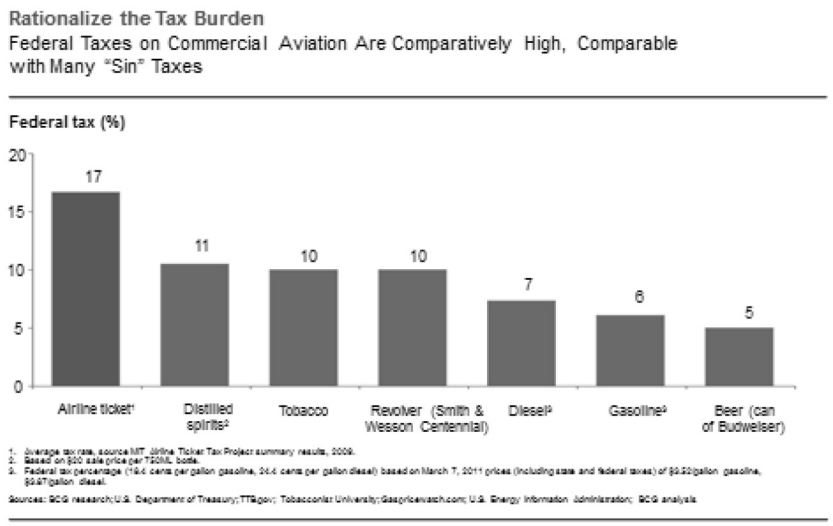
Again, other industries are not subjected to such irrational rules. These and other regulatory burdens weigh heavily on the airlines and, with the tax burden discussed below, conspire to hold them back from stability and profitability. When safety rules are taken into account, we estimate the annual regulatory burden of existing and proposed rules exceeds $3 billion. (Slide 4).

Slide 4

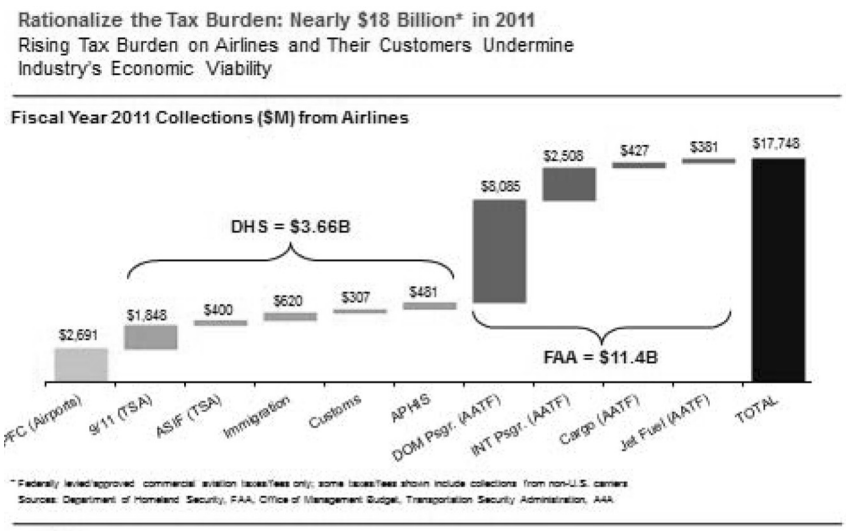


U.S. airlines and their customers are subjected to voracious taxes and fees that add up to 20 percent of the total price of an average domestic round-trip ticket. That is a 38 percent increase since 1990. No consideration is given to the impact of these government impositions on demand. In fact, commercial air transportation is taxed at a greater rate than products—alcoholic beverages and cigarettes—that are taxed in part to discourage consumption. (Slide 5) In 2011, airlines and their customers paid nearly $18 billion in taxes and fees, more than $11 billion of which went to the FAA Airport and Airway Trust Fund, more than $3 billion to the Department of Homeland Security, and more than $2.5 billion directly to airports. (Slide 6)

Slide 5



Slide 6



More recently, there have been attempts to have airlines and their customers pick up the tab to reduce the Federal budget deficit or to cover the cost for a payroll tax-cut extension. Last year and earlier this year, on multiple occasions, the administration offered a proposal that would triple the security tax we all pay on each flight, as well as impose on airlines a $100 tax on every plane departure. In the end, the proposals were rejected—but they are back. The White House budget proposal for Fiscal Year 2013 again proposes to triple the security tax and add a $100 departure tax. These new taxes alone would cost the airline industry $36 billion over the next 10 years.

The importance of these burdens is illustrated by comparing them to recent airline earnings—remembering first that U.S. airlines (passenger and cargo combined)

lost $53 billion during the period 2001–2011. In 2010, U.S. passenger airlines earned a total of $2.2 billion, and in 2011 less than $600 million, a mere 0.4 percent profit margin. (Slide 7) Put another way, in 2011 U.S. passenger airlines earned just $0.81 per passenger.

Slide 7

Finally, as the Committee knows, the European Union continues to press ahead with its Emissions Trading Scheme, despite the widespread condemnation of it as a unilateral measure that is an unprecedented transgression of national sovereignty, including that of the United States.

A4A and its member airlines are committed to reducing greenhouse gas emissions from aviation and, with fuel-efficiency improvements have saved more than 3.3 billion metric tons of CO_2 emissions since 1978, have a strong record of meeting that commitment. By investing billions of dollars in fuel-saving aircraft and engines, innovative technologies and advanced avionics, the U.S. airline industry improved its fuel efficiency by 120 percent between 1978 and 2011, resulting in emissions savings equivalent to taking 22 million cars off the road each of those years.

Our commitment is clear. The question is how to proceed? Our firm belief is that the United Nation's International Civil Aviation Organization is the proper, multilateral venue to develop a worldwide policy to reduce GHG emissions from commercial aircraft. We fully support ICAO's efforts and urge Congress and the Administration to oppose the EU's unilateralism.

U.S. Policy Has Not Evolved With the Changing Global Market While Other Countries Support Their Airlines

The United States has championed free trade in the airline sector, and the U.S. airline industry has supported that effort. Our members are efficient, effective enterprises and are anxious to compete in the global marketplace.

The U.S. has entered into 107 Open Skies agreements with aviation trading partners. These agreements liberalize the aviation relationship and allow airlines to decide route, frequency, capacity and pricing decisions based on commercial considerations free from government interference. As the State Department notes on its website, "Open Skies agreements have vastly expanded international passenger and cargo flights to and from the United States, promoting increased travel and trade, enhancing productivity, and spurring high-quality job opportunities and economic growth." *http://www.state.gov/e/eb/tra/ata/index.htm.*

U.S. policy for its airline sector has not kept up with the evolution of the global market for airline passenger and cargo services. As discussed above, regulations are not grounded in the Airline Deregulation Act's fundamental policy goal of encouraging "efficient and well-managed air carriers to earn adequate profits and attract capital" by "placing maximum reliance on competitive market forces." 49 U.S.C.

§ 40101(a)(6). Instead, regulatory initiatives are *ad-hoc* and are guided by the government's perception of the issue-of-the-day and the vestigial but disproven view that government judgment is superior to the discipline of the marketplace. Likewise, the government's ever-growing appetite to tax the airline industry has increased the number of taxes and fees airlines and their customers pay and, of course, the amount paid—with no regard for their impact on demand.

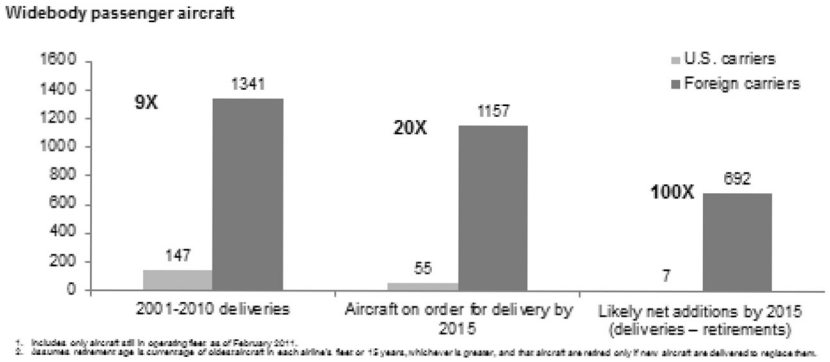
These factors illustrate that the U.S. does not have a coherent airline policy that recognizes the strategic value of the U.S. airline industry and seeks to advance its global competitiveness. Rather than "strengthening the competitive position of air carriers to at least ensure equality with foreign air carriers. . .to maintain and increase their profitability in foreign air transportation," another of the Airline Deregulation Act's specific policy goals (49 U.S.C. § 40101(a)(15)), the *ad-hoc* approach to the U.S. airline industry has hobbled it.

Other countries have championed their airlines. This is particularly true in South America, Asia and the Middle-East, areas that have seen strong growth and expansion by their airlines and where future demand is expected to be strong. Asian and Middle Eastern countries, in particular, have encouraged their airlines to grow and supported that growth with policies that reduce costs and encourage capital investment. Emirates and Singapore Airlines, for example, not only have large, young fleets of widebody aircraft, they also have considerably more widebody aircraft on order than U.S. airlines. (Slide 8) In fact, only one U.S. airline is on the list of the 15 airlines with the largest widebody orders. (Slide 9) With the greatest amount of growth forecast to be in the emerging economies, foreign airlines, not U.S. airlines, are poised to succeed. (Slide 10)

Slide 8

Enhance Global Competitiveness

Foreign Airlines' Widebody Aircraft Orders Dwarf Those of U.S. Airlines



1. Includes only aircraft still in operating fleet as of February 2011.
2. Assumes retirement age is curvemirage of oldest aircraft in each airline's fleet or 15 years, whichever is greater, and that aircraft are retired only if new aircraft are delivered to replace them.

Note: Excludes orders by lessors where operator is unknown.

Sources: ICAS and BCG analysis

Slide 9

Despite Older Widebody Fleets Than Many of Their Global Competitors, U.S. Passenger Airlines Have Comparatively Few Widebody Aircraft on Order

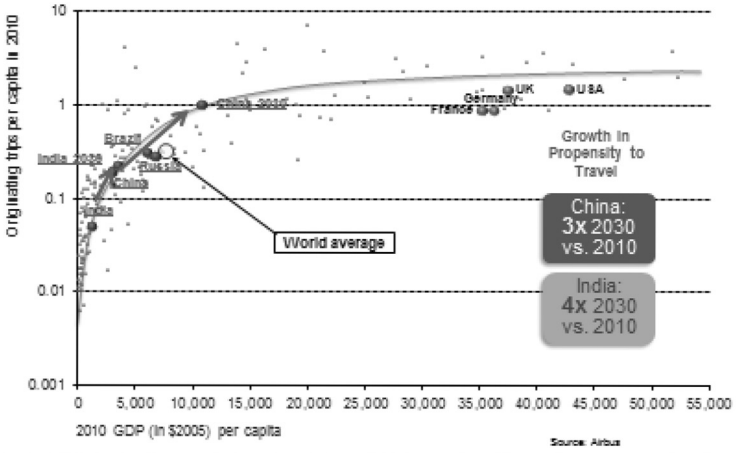
Widebody Aircraft in Service		#	Age	Widebody Aircraft on Order		#
1	FedEx	255	21.3	1	Emirates	238
2	Air France-KLM	178	10.1	2	Qatar	132
3	Emirates	171	6.6	3	Cathay Pacific	88
4	Lufthansa-SWISS-Austrian	160	10.8	4	LATAM	79
5	**Delta**	**159**	**13.6**	5	Etihad, **United**	75
6	IAG (BA-Iberia)	158	14.2	6	Aeroflot	71
7	**United**	**155**	**14.4**	7	Singapore	65
8	UPS	154	11.9	8	Air China, All Nippon	51
9	Cathay Pacific	133	10.4	9	IAG (BA-Iberia)	44
10	All Nippon	127	11.7	10	Korean, Qantas	43
11	**American**	**120**	**16.6**	11	Air Canada, Thai	42
12	Singapore	113	7.1	12	FedEx, Hong Kong	40
13	Korean	106	10.9	13	Asiana	37
14	JAL	98	9.7	14	Gulf	36
15	Thai	81	11.2	15	Lufthansa	35

Source: Ch Ni fleet data for June 2012

Slide 10

Growth Opportunities for U.S. Airlines Abound in the BRIC Nations

Unlike Developed Economies, Emerging Economies Drive Strong Travel Growth



Source: Airbus

The international carriers who are buying the majority of planes today are providing the connectivity their governments envisioned—and driving economic growth in the process. This includes flying to the United States in increasing numbers—to our major cities—which has caused U.S. carriers to pull down capacity in some international markets, which is the most profitable part of the business and a part of the business that subsidizes—to a great degree—our domestic routes.

The impact of the Open Skies initiative coupled with the absence of a coherent airline industry policy is plain. 107 foreign airlines will fly to the U.S. from 98 countries in the third quarter 2012. This compares to 11 U.S. airlines scheduled to fly to 77 countries. Today, Emirates operates to Houston, Dallas, Los Angeles, San

Francisco, New York JFK and Seattle, and just announced plans to launch service to Washington, D.C. in September. Etihad operates to New York JFK and Chicago. And they start service to Dulles in 2013. They are not alone. Dozens of foreign-flag carriers serve the United States today and more are looking to add service, including Brazil's Gol, which has announced plans for service to Miami.

Why is this important?

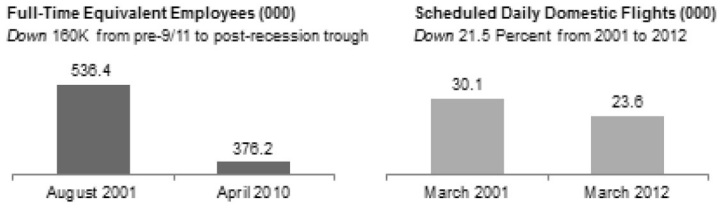
A strong airline industry drives high-quality, middle-class American jobs within the industry and is the foundation for jobs in the broader aviation industry. As we learned from the post-9/11 and post-recession years, an unprofitable airline industry translates directly into job loss, reduced service and reduced investment in airplanes, facilities and equipment. The entire value chain suffers. In August 2001, industry employment exceeded 536,000 full time equivalent employees. By April 2010, that number had dropped to just over 376,000, a loss of 160,000 good paying jobs. Likewise, an unprofitable industry cannot sustain the level of service America needs. In March 2001, there were just over 30,000 daily scheduled domestic flights. That number dropped more than 21 percent, to 23,600 daily scheduled domestic flights, in March 2012. (Slide 11)

Slide 11

Why Is a Comprehensive Airline Policy in the National Interest?

U.S. Airline Industry Financial Woes Lead to Cuts in U.S. Employment and Air Service

- Reduced earnings translate to a lower Return on Invested Capital (ROIC)
- Lower ROIC compels management to pursue means of improving ROIC
- Reduced investment in the business has manifested in the form of less air service, fewer jobs, delayed fleet renewal, reduced in-flight service options and, for some airlines, bankruptcies
- In the case of U.S. passenger airlines, employees were reduced by 160,200 from pre-9/11 levels to the post-recession trough that occurred in Spring 2010; departures remain sharply curtailed



Foreign carriers will not directly serve smaller U.S. markets. They will cherry pick profitable cities and rely on others to provide connectivity, at whatever cost, across the rest of the country. That is not good for American businesses or consumers.

The U.S. network carriers have a vested interest. Their business model accommodates connecting every part of the country with the revenues from the more profitable segments subsidizing the much less profitable, smaller communities. To continue to provide such service, U.S. carriers need a more rational, normalized business environment, with less government interference, and with a fair tax and fee structure. Our airlines want to compete head to head with their international competitors but on a more level playing field.

A4A Calls for a National Airline Policy

For all of the reasons discussed above, A4A is calling for enactment of a National Airline Policy—a comprehensive approach to putting the U.S. airline industry in a position to survive and thrive; a policy in keeping with the fundamental role it plays in the U.S. economy and that gives substance to the aspirations for the industry articulated in the Airline Deregulation Act.

These are the five core components that together form the basis of an effective National Airline Policy:

1. Reform our tax structure: Reduce taxes on this industry and our already overburdened customers.

2. Reform our regulatory environment: Ensure rules are based on sound science and cost analysis and eliminate rules that drive excessive costs or inefficiencies while doing nothing for safety or consumer benefit.
3. Fix the infrastructure—NextGen: Accelerate the deployment of the most cost-beneficial elements of NextGen by implementing policies and procedures to use the equipment we have in place today.
4. Enable global competitiveness: This industry needs to compete on a level playing field with global competitors. Endorse global strategies to address issues that affect us all, like the EU–ETS plan, and put in place the policies, resources and structure to promote business and leisure travel and tourism in the United States; and
5. Mitigate fuel costs and volatility: We need the Commodity Futures Trading Commission (CFTC) to follow its mandate and curb excessive speculation in the oil futures market and, at the same time, we need to bolster domestic fuels production and alternate fuels development in an environmentally sound manner.

This is a significant list with a great deal of work required on each part—and it will take time and unified engagement with Congress and the administration to get it done. A4A is committed to doing just that.

In conclusion, there is much to do but there can be no question that we need a holistic approach that addresses the fundamental tax, regulatory and infrastructure challenges that prevent this industry from being sustainably profitable—and globally competitive.

Senator CANTWELL. Thank you, Mr. Calio.

And, again, thanks to all the panelists. You've given us a lot to think about. And we'll start a round of questioning, and I think I'll start off here.

Dr. Tracy, you mentioned in your written testimony—I want to get at this question about R&D and technology first, and anybody else can weigh in if they want. But one of the things I read in your testimony is about NASA cutting back on some of its partnering as it related to basic research in aerospace.

So are we backing away from key science-based questions that we need to answer to keep competitive? And how much does the R&D tax credit play into that issue as well?

Dr. TRACY. Madam Chair, with respect to the R&D tax credit, I'm an engineer, not a tax expert. So I'll have a full explanation of the tax side sent into the written record.

[The information referred to follows:]

THE BOEING COMPANY
Chicago, IL, July 27, 2012

Hon. MARIA CANTWELL,
Chairman,
Senate Committee on Commerce, Science, and Transportation,
Subcommittee on Aviation,
Washington, DC.

Dear Senator Cantwell:

In response to your question to Dr. John Tracy at the U.S. Senate Subcommittee on Aviation Operations, Safety, and Security; Committee on Commerce, Science, and Transportation hearing titled "The Global Competitiveness of the U.S. Aviation Industry: Addressing Competition Issues to Maintain U.S. Leadership in the Aerospace Market" on Wednesday, July 18, 2012, we respectfully submit the following information.

During the question and answer period, you asked Dr. Tracy how much of an impact the R&D tax credit has on the competitiveness of the United States. The Boeing Company is one of the leading innovative companies in the world and spends billions of dollars each year on research and development in the United States. The R&D tax credit allows American companies, like The Boeing Company, to remain in stride with global competitors while also providing an incentive for high-skilled, technologically advanced jobs to be created as well as sustained in the United

States. However, the incremental structure of the R&D tax credit, the fact that it is temporary in nature, and the tremendous amount of resources needed to meet IRS approval of eligible expenses dilutes the value and effectiveness of the credit for American companies.

To remain competitive in the short-term, the United States must reinstate the R&D tax credit for 2012. In the future, if policymakers determine that innovation incentives are important to retain in the context of comprehensive tax reform, they should reevaluate the current structure of the credit and consider making it permanent and less administratively burdensome. By doing so, companies will have more certainty around the incentives available to them and their ability to effectively utilize those incentives. This will ensure a strong commitment to invest in new technologies and innovation here in the United States.

If you need additional information, please do not hesitate to contact me.

Sincerely,

JAMES ZRUST,
Vice President—Tax.

cc: Tim Keating, Senior Vice President of Government Operations
Stacey Dion, Vice President of Corporate Public Policy

Dr. TRACY. But from my perspective, NASA in general and NASA aviation investment has reduced dramatically over the last several years. I believe that in the United States, in aviation investment for research and development in NASA, we're probably 10 percent of what the European Union is investing in similar areas. And this impacts——

Senator CANTWELL. What kind of technology are we talking about?

Dr. TRACY. Oh, everything from the control of unmanned aerial vehicles to software reliability—software is so important in the way we control the vehicles today—to composite materials that Senator Warner mentioned—every aspect you can imagine. The vehicles today—we have to use technology to achieve the levels of performance that will allow our airline customers to be profitable, to reduce emissions, and to improve safety. And without investments in R&D, it's just very difficult to do that.

Senator CANTWELL. So are the Europeans catching up, or are they truly ahead on this next cutting-edge technology? Because I would say, "Wait a minute. The 787 is a composite plane, and that was a big winner in the marketplace." So in that area, we were ahead.

Dr. TRACY. I believe that the reason that the Europeans are investing at a rate of 10 to 1, compared to us, is because they see the $4.5 trillion market for commercial airplanes that was mentioned, and they want to make sure that they are the dominant player there. So in some areas, they've caught up. In the area of composites, they're still working to catch up to our level, in my opinion. But it's an intense competition, and I'm very concerned about the levels of NASA investment.

One other thing that ties into one of your areas of interest is in terms of STEM education in our next generation. I, for instance, was inspired to become an engineer because of a NASA flight demonstration program called the X–15 that I saw when I was 5 years old. It's those NASA big picture things that young people can see and be inspired by that really are the key to our future generations developing interest in this area.

Senator CANTWELL. Thank you.

Mr. Elwell, a little bit on the R&D. Could you and Mr. Bunce just say, what are the two or three things you would do to help streamline the FAA certification process?

Mr. ELWELL. I think, clearly, the biggest factor is to get organization and delegation authority robust—to pay full attention to it. It simply is too big a job across the full spectrum, from type certification to certification of aftermarket products and the like. It's just too big a job for FAA to put, you know, one man or two men or women on each project.

We've got to have ODA, which is, you know, one of the things we're looking at in the 312 work that we're doing with FAA. That's probably the single most effective thing we can do—is make ODA a reality throughout the process.

Senator CANTWELL. Mr. Bunce?

Mr. BUNCE. Senator, I think when we look at the authorities that both the Congress and the FAA have talked about in this organization and delegation authority, it's also important to be able to say, "OK. How are you really going to use it?" Because that queue I talked about, that 18-month queue, could really significantly be reduced if we allowed for a safety system oversight by the FAA.

Now, one of the things we have to do is we have to do workforce development within the FAA, because it's becoming more and more complex for them to be able to regulate an industry that is becoming much more software dependent and data driven. And so we spend a lot of time training the regulator. So we've got to do not only workforce development for our own workers within our factories, but also to help the FAA and train their workforce.

A lot of people say throw more resources at the FAA. And especially when you look at what's going to be required for NextGen and if, oh, by the way, we certify these unmanned aerial systems, then that's going to add a burden to a system that's already stretched to the point where it's becoming very ineffective. We're going to break the system if we do that.

So we have to be able to do this streamlining. And the streamlining is taking an approach that we've got to give the FAA leadership here in Washington the tools to break down some of those stovepipes, to be able to manage from Washington, and be able to say, "OK. Here is the regulation. Go ahead and allow industry—you don't have to be sitting over—and these great engineers that we have working for us in our companies—you don't need to look over their shoulder all the time."

You need to look at a systems approach to safety and be able to apply these principles that are being proliferated around the world, called SMS. ICAO is directing this for all of aviation, for commercial and general, all over the planet. And we can go and use those principles to be able to streamline the process, and that is truly the most important thing we can do.

Senator CANTWELL. Is the European system more streamlined?

Mr. BUNCE. No, ma'am. I would say the European system—there isn't the volume. And they also have a system that—it's incredible. They have a fees and charges program for it, and I would say that that one is inefficient enough that we were just told a few weeks ago that we're going to be paying for the retirement programs for EASA workers in the fees and charges that they're charging our

companies. So the European model is not the way that we want to go.

We have a system that can work if we're allowed to use the delegation authorities that you and the FAA have already said we should be able to use. But they're not allowing us to implement them.

Senator CANTWELL. Thank you.

Senator Isakson?

Senator ISAKSON. Well, thank you, Madam Chair. Before I ask a question, I'd like to ask unanimous consent, if I can, to submit for the record an editorial that appeared in *Aviation Week* on the 16th of July of this year, just a few days ago, whose title was "American Aerospace on the Block."

Senator CANTWELL. Without objection.

[The information referred to follows:]

Aviation Week & Space Technology. 7/16/2012, Vol. 174 Issue 25, p58–1NULL. 1p.

AMERICAN AEROSPACE ON THE BLOCK

Emotions Should Not Dictate Fate of Hawker Beechcraft

Shock, disbelief, dismay, distrust. Stages of grief?

No, these adjectives sum up the reaction to the news that Hawker Beechcraft has agreed to sell itself to a Chinese manufacturer for about $1.8 billion (see p. 40). It remains to be seen whether the property will actually change hands, although there is no reason at this point to doubt it will. Nonetheless, the announcement stunned aerospace professionals.

It doesn't take a psychologist to explain why. Beechcraft is an icon of American aircraft manufacturing. Hawker Beechcraft is the once proud and thriving linchpin of Wichita—the aviation capital of the U.S. And now, the company has sunk into such desperation that it must fall not just to the highest bidder but to one in Beijing.

Hawker Beechcraft's defense business is not included in the sale and will continue as a separate entity, building T–6 training and AT–6 light-attack aircraft. That would seem to neatly side-step any heartburn the Defense Department might get. But Hawker Beechcraft's announcement does not mention the Beechcraft King Air, a twin turboprop that has become as synonymous with military intelligence, surveillance and reconnaissance as it is with cost-effective business aviation.

Even if the specialized task of modifying commercial King Airs into military platforms stays with Hawker Beechcraft's defense operation, the aircraft themselves will be built by a Chinese-owned entity. Indeed, they have to be. Without its workhorse twin-turboprop, the company would be next to worthless to its new owners.

Then there is the troubling question about the automated fiber-placement technology pioneered by Hawker Beechcraft to build composite fuselages of Premier I and Hawker 4000 business jets and later used by Boeing on the 787. Can transfer of that technology be prevented and its use be limited to Hawker Beechcraft commercial airplanes?

U.S. authorities who decide whether to allow the sale of Hawker Beechcraft to Superior Aviation Beijing face a difficult decision. There is the politics swirling around legitimate concerns for the Wichita jobs that may be at risk, and there are issues of protecting national security and safeguarding dual-use technologies.

So how do we progress through the stages from initial shock to eventual acceptance—or rejection—of the deal? First, we must dispense with the emotion surrounding the names of Hawker and Beechcraft. In truth, the company has had a checkered history. And it has changed hands before.

Beech Aircraft was acquired by Raytheon in 1980. The Hawker line was added from British Aerospace in 1993. And the two merged to form Raytheon Aircraft in 1994. It was an uneasy marriage, and the company was sold to private equity firms Onex of Canada and Goldman Sachs of the U.S. for $3.3 billion in 2007. Then, in 2008, a vicious economic downturn slammed the entire business aviation sector. Hawker Beechcraft limped along until it filed for bankruptcy court protection this May, and a short time later put itself on the auction block.

Focusing on what really matters, the central question is whether national security policy makers should prevent, not just the modification of special-mission King Airs,

but also the production of the basic platform from falling under foreign control. It is easy to say there are plenty of U.S.-owned companies that could take over the support of King Airs operated by the U.S. military. Harder to determine is whether Chinese control of the company that produces the basic platform might one day pose a threat to the U.S. and allied militaries that depend on the King Air.

Moreover, there is no replacement for the King Air the Pentagon can easily substitute. Regrettably, U.S. aerospace has largely turned away from the turboprop market in its search for higher-value sales. The nearest equivalents are the Swiss Pilatus PC–12, Italian Piaggio Avant and Canadian Viking Twin Otter, and none has the stars and stripes flying over its corporate headquarters. There is no getting around the notion that the company formed by Walter and Olive Ann Beech in 1932, and which carries a Hawker name dating back to 1920, should have to be sold in the first place. But the hard truth, no matter how distasteful, is that China is where much of the growth in business and general aviation will occur. After all, Cessna is already planning to develop and build business jets with China.

There are any number of venerable names that stir the passion of aviation professionals. Consider the great ones that fell victim to the wave of consolidation of the U.S. aerospace industry starting in the early 1990s. And where would aviation be without the passion!

But passion must not influence whether Hawker Beechcraft stays a U.S. company. If the transaction is to be blocked, it ought to be because the company's products and technology must remain U.S.-controlled on the grounds of national security. If there is not a compelling case, let market forces shape the evolution of the global aviation industry as they have done since the birth of powered flight more than 100 years ago.

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Senator ISAKSON. And now I'd like to read the opening paragraph, if I can. "Shock, disbelief, dismay, and distrust—stages of grief? No. These are the adjectives that sum up the reaction to the news that Hawker Beechcraft has agreed to sell itself to a Chinese manufacturer for $1.8 billion."

So I think in talking about competitiveness today, it's important that we recognize the importance of manufacturing on American soil and the important contribution it makes to the American economy.

And, Mr. Bunce, you made two points that—when I read that editorial today and when I listened and read your testimony—read your testimony earlier and then listened to it today, I want to focus on two points for a second, if I can.

One, Mr. Bunce talked about new product certification at FAA. As I understand it, they have a sequencing system on taking these new products which can delay the beginning of the evaluation as much as 18 months. Is that correct?

Mr. BUNCE. Yes, Senator.

Senator ISAKSON. If you could do it in a faster sequence somewhere else, you'd want to go there to do it, right?

Mr. BUNCE. Absolutely.

Senator ISAKSON. That's the point I want to make. So when you take this editorial and you read it, and then you read that you have a delay as long as 18 months before the regulatory agency that oversees you even begins the process of certifying a new product, you understand how government has a role in making sure we remain competitive.

To that end—in the previous administration, I worked with Mr. Calio on some projects. And one of my subcommittees on another committee of the Senate is the Labor and Occupational Safety Committee. And I know there have been efforts in the past where regulatory authorities over American business and enterprise have

done partnerships with the industry itself to end up speeding up the process of evaluation and accountability.

Can you discuss, Mr. Bunce, if you would—or if you all have ever made any suggestions—how you could partner with the FAA to make it easier for them to streamline the new product evaluation process?

Mr. BUNCE. Senator, we've actually done that. And with our partners at AIA, we've got a steering group of aerospace leaders together with the FAA leadership. And I will say that Acting Administrator Huerta has been very receptive. In fact, he's talked about this in several of his speeches as one of the initiatives that they have to use in the FAA, knowing that their budget is going to be fiscally constrained with the state that we're in right now.

So we feel like we've got something moving forward. We've got some metrics designed. Those metrics will come back to you in a report that you asked for from the FAA reauthorization act. And what you can do to help us is keep pressure on them. Just that one report isn't going to be good enough.

If you can help us to help the FAA be able to lead—because, truly, they have to drive change within the workforce, and it's good change, because we can make these great people that we have working in the FAA more effective in safety management if they go and get out of having a sharp pencil and looking at every minute detail that our great engineering workforce does and be out there and be safety managers. And that truly can make a difference for us.

Senator ISAKSON. And it's more economical, I would think, for a manufacturer to bear some of the costs of certification and the process rather than wait 18 months to even begin a process. Am I correct?

Mr. BUNCE. Absolutely. That time is critical. If we have to delay that project—and, as I said, some companies have been forced to go overseas to do it somewhere else just to get the project going. The other things that they're also doing is breaking up projects to try to get it underneath the threshold where sequencing applies. So they're breaking that project up, which is very inefficient. But they're trying to do that to work around this sequencing system. So it is causing a delay of being able to start any of the projects, as you've said, Senator.

Senator ISAKSON. Second, you talked about foreign repair stations. And I have a—being the Ranking Member of the Africa Subcommittee, and given the fact that Delta now flies so much into Africa, and Gulfstream manufactures planes that fly worldwide, I was shocked to understand—and if I'm wrong on this, tell me. But I think I read it right in your testimony. In 2007, Congress mandated that FAA develop the rules and regulations for foreign repair stations, and they still haven't done it. Is that correct?

Mr. BUNCE. Sir, it's actually the Department of Homeland Security that has to do the rules. And in 2007—actually, 10 years ago, you all said that TSA and DHS should do this. It was in 2007 when we were kind of put as a lunchmeat in the middle, and the FAA wasn't allowed to issue any new certifications for new repair stations. So we're being punished because DHS hasn't done their job to get this rule out.

There is no controversy about the rule. It's just that, from what we understand, DHS is saying, "Well, we see no security threat, so it's not our priority." But the trouble is it's costing American jobs. So what we would ask is, again, if you can pressure DHS and just say, "Get the rule done." That's all we need, and we can go ahead and start having these repair stations again up and running, and people can have confidence they can get their FAA-certified products serviced overseas.

Senator ISAKSON. I'll take just one additional second, if I may. And in a worldwide marketplace where our manufacturers, like Boeing in Washington and Gulfstream in Georgia and others, sell to the world, these impediments by delays in regulatory authority or by not being able to approve new products faster, just push the business to look for other options. Is that right?

Mr. BUNCE. Absolutely, sir. We have a case where there was an order placed with one of our companies here in the U.S., and we couldn't get the process through the FAA in time. And it was just basically to put winglets on an aircraft, and winglets were relatively easy. And all of a sudden, another manufacturer in another country that has a different certification authority said, "We can do it," and they lost the whole order.

Senator ISAKSON. Thank you very much.

Thank you, Madam Chairman.

Senator CANTWELL. Senator Warner would be next, but I'm sure he'll be back.

So Senator Begich?

STATEMENT OF HON. MARK BEGICH,
U.S. SENATOR FROM ALASKA

Senator BEGICH. Thank you very much.

Thank you, all of you, for being here today and testifying.

First, Mr. Bunce, I have a quick question for you. I know, in your testimony, you had some good data on general aviation. You know, we love general aviation in Alaska. We live it. It's, for us, in some cases, like an automobile in order to get around. So we thank you for the work you're doing.

But you mentioned some issues around FAA. And if you could pinpoint one—if you had an opportunity to say, "Here's the one thing in FAA" that you would want us to push on with regards to general aviation, to help improve the capacity of general aviation, do you have a feel of what that might be? I know there are lots of items, but is there one that you would say, "This would make a difference to the general aviation."? It may be on the manufacturing side or the transport side. Is there any thought there?

Mr. BUNCE. Senator, I think that, again, we've all talked about certification. And I think across the board, all the way from the products that Mr. Calio's organization buys to anybody up in Alaska buying a general aviation aircraft, certification of not only new products, but also to be able to get what we call STCs—modifications. And the pilots up in Alaska do that all the time, and to be able to get those through the system efficiently is the best thing that can happen for all of general aviation and I would say all of civil aviation in the United States.

Senator BEGICH. Very good.

Mr. Calio, if I could ask you a couple of questions—in your verbal testimony as well as in your written testimony, you talked about the tax policies and the over-burdensome regulation. But let me focus, if I can, on taxes.

I was looking at some of your charts and so forth that were included. I would just say one thing. What you had in here, I think was, Rationalization for Tax Burden, and you had "Federal Taxes on Commercial Aviation are Comparatively High, Comparable with Many 'Sin' Taxes." You've listed in sin taxes a revolver, Smith and Wesson, diesel, and gasoline. From Alaska's perspective, we don't think those are sins.

[Laughter.]

So we want to make sure we're clear on that. You know, you can have distilled spirits, tobacco—we might not even think beer is a sin, either. But, definitely, our guns and our fuel are not. So just a little fun there.

But your point, which I want to get to, is you indicate that the tax structure is too high in comparison to those items, none of those do we provide infrastructure for. We don't build liquor stores. We don't build tobacco plants. We don't build gun factories. Put aside the $100 issue, because I oppose that. The administration is way off on that. They're wrong. The GA folks know this more than they can imagine.

But how do we pay for the infrastructure, then? Because, as you know, a sizable amount of money goes into the trust fund. I can tell you as a former mayor, we owned an airport, and we invested into Merrill Field significantly, improved the capacity for our pilots to land safely. How do we pay for this?

Mr. CALIO. Well, Senator, first of all, most airports currently have investment grade ratings but the airlines don't. And if we're here to address global competitiveness of the entire industry, and I'm here to represent the airline industry, I think you have to look at the state of the industry. It lost $50 billion and 160,000 jobs, over one-third of the workforce, over a 10 year period. It made less than a quarter of a penny in profit over the last two years, but it's a profit. We created 10,000 new jobs last year as a result of that.

And I think you have to look more broadly at how the industry is taxed. There are 17 separate taxes and fees on the airline industry and its passengers. If you buy your typical round-trip ticket, $300, on a domestic route, $61 is taxes and fees. And the GAO came out with a study a few years ago. If you increase taxes or fees by $1, you're going to suppress demand by .5 percent to 1.8 percent.

Senator BEGICH. I understand that. But let me step back again. I want to get to the question, because I've looked at the charts. I've studied the material that you have. And I just want to—you know, from us—you know, we're the international hub for FedEx and UPS. We ship 700 wide-bodies every week out of our airport to an enormous amount of markets throughout the world. Aviation is a big part of our life and economy in Alaska.

So I'm just trying to figure this out—your chart of comparison of sin tax is no comparison, in my view. How do we pay for the infrastructure, maybe NextGen or the airport improvements, or those things? I'm not saying raise taxes. Your comment was to lower

taxes. So I'm trying to figure out how we do that and then build an infrastructure that supports a great aviation system that this country has.

Mr. CALIO. Senator, I don't think you can rely on the airlines solely to do that.

Senator BEGICH. OK. That's what I was trying to get to. In other words, you believe we need to step one more step out now that's outside of the aviation fees and so forth, that we need to put more general dollars——

Mr. CALIO. I think you need to look at the state of the industry and see where it stands and what you can do and whether you can burden one part of the industry or one industry in and of itself more.

Senator BEGICH. I got you. I understand now what you're saying. From the broader expanse of aviation, airlines are taking a big chunk of it, and there are other pieces to the equation.

Mr. CALIO. There's other pieces. We're not suggesting to tax them. I would say that I think—you know, the trust fund last year hit record levels, you know.

Senator BEGICH. Right.

Mr. CALIO. The airports took in record revenues, $22.2 billion in 2011. So it's not as if the money is not there.

Senator BEGICH. I got you.

Mr. CALIO. There are bonds, and airlines contribute a great—if you look at Chicago, you know, American and United are contributing there. And other airlines do that across the board at all these different airports across the country.

But I think it gets back to the analogy of the maritime industry. We can sit here and keep using the airline industry as a cash cow, and it will continue to wither, and we'll continue to lose jobs. The industry has done a very good job of trying to right itself in recent years.

Senator BEGICH. I agree.

Mr. CALIO. As a result of everything it does, we have about the lowest unit cost in the world right now. But you raise prices, no matter how you do it—there are two ways, two ways, that you can get back to try to sustain profitability. And that's either you cut service or you cut employees, and that's about it. We have nowhere else to go.

Senator BEGICH. Very good. Thank you very much for your testimony. Thank you for the information, too. You did a lot of good charts here that I appreciate, because it's in a broad sense. So thank you for that.

Mr. CALIO. Thank you, Senator.

Senator CANTWELL. Senator Lautenberg?

STATEMENT OF HON. FRANK R. LAUTENBERG, U.S. SENATOR FROM NEW JERSEY

Senator LAUTENBERG. Thanks, Madam Chairman, for holding this hearing. It sounds like a bit of an anomaly to me. We hear fairly bold projections in terms of what the volume of opportunity of business is going to be for the industry. And I hear tales of woe about whether or not we have enough people to service these opportunities, and the two things don't seem to go together, because

competing airlines from other countries certainly must have at least had the same problems that we're looking at. So it needs a little bit of straightening out, as far as I'm concerned.

And, Mr. Elwell or Dr. Tracy, maintaining our global competitiveness, preparing for the projected growth in the industry, suggests that we have to make substantial investments to upgrade our aviation system. However, we're looking at sequestration in 2013. Drastic budget cuts will evolve from that. What impact will these cuts have on our ability to improve or maintain—or at least not fall back on our aviation sector?

Mr. ELWELL. Well, Senator, are you asking specifically what we think sequestration could do to FAA and to our industry?

Senator LAUTENBERG. Yes.

Mr. ELWELL. Obviously, there are more questions than there are answers to sequestration, how they'll implement it. But the way we've looked at it for FAA, for instance, on the non-defense side, it would be over $1 billion a year for 10 years. That's, as you well know, sir, huge for an agency with a $15 billion budget.

The devil, of course, would be in the implementation details, you know. Where would they make the cuts? If they make them in the biggest account, which is the Ops account, there would be tower closures—I mean, I don't know how they would do $1 billion out of $9.5 billion when they're already stretched—their budget is stretched thinly.

But they're likely to preserve operations if they have the discretion to move sequestration, and the place—if you're going to try to run an operation, the place you're going to cut is future programs. So I think NextGen is very, very vulnerable in a sequestration scenario.

And in partial answer to Senator Begich's question about how you fund the system going forward, much like the initial investment to build the national highway system produced huge economic benefit to the country, more than paid for itself over and over again—the same thing if we do the upfront investment for NextGen. The efficiencies, the ability to move traffic, and the economic benefits that NextGen will give us will more than pay for it. And so, you know, conversely, if sequestration guts NextGen——

Senator LAUTENBERG. But, of course, Mr. Elwell, you have to look at what might be a doomsday projection and say, "OK. What do we do if we don't close that gap?" What do you do? Cut services, cut equipment sales?

What happens, Dr. Tracy, in this event?

Dr. TRACY. Senator Lautenberg, thank you for this question. I read a lot always about the effects of sequestration on the Department of Defense, but I'm not going to address that at all. I'm going to talk specifically about the FAA.

There are two aspects to that that concern me. One is the implementation of NextGen, which will be a huge opportunity lost in terms of—if NextGen is implemented, we have the opportunity to increase the efficiency of the airspace by 35 percent, the efficiency of the airports by 50 percent, to literally save billions of gallons of fuel. The airlines, I think, in 2011 spent $174 billion on fuel, and implementing NextGen can help reduce the amount of fuel they need and the emissions by something like 12 to 15 percent.

So on one hand, I think it's a huge opportunity lost by not implementing NextGen. The other side of the equation has to do with product development and the other parts of the FAA that help us certify the products. We've talked about potential improvements in efficiency. But, for us, we've just put into service two new airplanes that we believe change the face of civil aviation, the 787 and the 747–8, each saving between 15 and 20 percent of fuel and operating costs, helping our airlines.

The ability to produce and implement and certify new products of the future in conjunction with the FAA, who was a partner with us, to assure the safety of these products, I believe, will be impacted negatively in the case of sequestration.

Senator LAUTENBERG. If I may, Madam Chairman, for a moment—are we seeing better progress in the new generation in other major countries and their systems?

Dr. TRACY. In terms of their certification process or in terms of their air——

Senator LAUTENBERG. In terms of the development of the efficiency of the system, whether it's less fuel, whether it's more mechanical management of the airplanes, et cetera. Are there places where it's done better?

Dr. TRACY. No. I think the United States is in a position where we lead the world with products that are progressive environmentally, in terms of fuel efficiency, in terms of bringing value to the airline customer.

Senator LAUTENBERG. Mr. Elwell?

Mr. ELWELL. The one difference, though, Senator, I will tell you, in the emerging markets, the emerging countries, they can go straight to NextGen. They don't have this legacy infrastructure that we have. So they're likely—once they get it, they're likely to put it in much faster than we can.

Senator CANTWELL. Good point. Thank you.

Senator Thune and then Senator Warner.

Senator THUNE. Thank you, Madam Chair. With respect to the Senator from New Jersey's line of questioning about sequestration, the House of Representatives this afternoon passed a bill, 414 to 2, that would require the administration to put forward a plan for implementation of sequestration. I've got a companion bill in the Senate along with Senator Sessions that would require that.

I think it would be very helpful for a lot of decision making, not only ours, but yours, to at least have an idea about how this sequestration is going to be implemented. And so I hope we can get that acted on here in the Senate, particularly with the big vote coming out of the House today.

I want to ask a question, and anybody on the panel feel free to answer this. But the EU Emission Trading Scheme is clearly, in my view, a unilateral and unfair tax policy that is hurting U.S. operators flying into and out of Europe. And my view is we need to protect our operators and the traveling public from this unnecessary tax.

And I guess the question is do you agree, and if you do, what impact do increased taxes, especially when they're collected for a country's treasury as opposed to—for general or for aviation infra-

structure operations? What impact do taxes like that have on the U.S. aviation competitiveness?

Dr. TRACY. Senator Thune, with respect to the ETS, it just doesn't accomplish what we're trying to accomplish. There are other means to reduce emissions that are much more efficient. ICAO, as was mentioned earlier—across the industry, we've come up with an agreement that, as an industry, we'll improve the fuel efficiency and reduce the emissions of the global fleet by 1.5 percent a year.

By 2020, we've agreed to achieve carbon neutral growth. By 2050, we've agreed that we will be able—or we will strive to cut the amount of emissions in half from the 2005 baseline. We're focusing on coming up with a metric and then standards for each new product and also investing in biofuels. So there are other ways to achieve emissions. The ETS scheme, because it's regional and because it's not covering the aerospace sector but just throwing—it will cause taxes that will never get fed back into the system to improve the basic problem of reducing emissions and improving products.

And so I just think it's pointed in the wrong direction, and it'll end up distorting markets, because what counts in that scheme is where you took off from, and if you land in Europe, you're taxed for the full region. So people will be taxed unfairly based on what their current route structure is and frequency, and it'll have nothing to do with reducing emissions, in my opinion.

Mr. CALIO. Senator Thune, if I could just add, I agree with everything Dr. Tracy said. I think the impact would be, as I noted earlier, you increase prices, you suppress demand, and the prices are only going to go up over time. And, in particular, I would note that this is not going back into aviation. It's not going to the environment. It's for whatever they want it for.

Mr. BUNCE. Senator, I was just over at Euro Control in Brussels about 2 weeks ago, and they gave us a briefing on their ability to implement Single European Skies. And they've pretty much given up on an ability even to integrate what's called functional airspace blocks just to be able to get a basic system where they can get their controllers talking to one another and working together.

So right now, they don't have any ability to use all of the benefits that we call NextGen over here. Their research arm is called SESAR [Single European Sky ATM Research] because they just can't get their airspace act together. So it's each individual country with their own controllers, that each have different weigh scales, and there is no political will to cobble this thing together and really do Single European Skies, which is really where they'll get the environmental gains.

I would argue that if they were really serious about doing something about the environment, the first thing they would do is make Single European Skies work and then talk about taxing after that. So it is really something that I think when you have a chance to talk to your European colleagues—and when we go to Brussels and we talk to the European Commission, we very much get the feeling that it is not the people responsible for aviation that's driving this trend and has dug their feet in on this issue.

It's an interesting thing within the European Parliament, where the folks—the environmental ministers have really driven this trend. They're against all reason of what the aviation community has.

Senator THUNE. Madam Chair, I see my time has expired. I have another question, but I can ask it later.

Senator CANTWELL. Thank you.

Senator Warner?

STATEMENT OF HON. MARK WARNER, U.S. SENATOR FROM VIRGINIA

Senator WARNER. Thank you, Madam Chair. I want to join Senator Thune. I hope that vote in the House will mean that we'll recognize that on sequestration—that to continue to punt on these issues, that maybe this will mean we can see the kind of bipartisan consensus that we've got to generate some additional revenues and reform our entitlement programs so we can actually take on the bigger deal, which at the end of the day, in my view, there's nothing that's more important in terms of generating job growth and economic activity than restoring basic confidence. But it's going to take some give on both sides.

Let me go to Dr. Tracy. And I appreciate your earlier comments about the great opportunities we have in aviation and the diminishing role that NASA has played in competing with our European rivals and others in terms of basic research. One of the areas that, again, your company has been one of the absolute leaders in the world has been composites. And kudos to you on your 757 Dreamliner.

But as we all know, the composite research takes years, and the cost return is one only a company of your size and capability would take on. We are exploring—and I appreciate again Boeing's participation to date, and I'd love to see more of this—creating a public-private partnership at NASA Langley that would include all members of the industry to try to take the composite development to utilization of modeling a simulation from this 10 to 15-year process down to a 3 to 5-year process.

I'd like to have you comment, Dr. Tracy, on your sense of the opportunity here and some of the challenges you might have in a public-private partnership in terms of intellectual property sharing. And we talked—as Mr. Sorscher said, a bit more about trying to make sure we do this in America. My hope would be, since we have dramatically upgraded our wind tunnel investments in the United States, that Boeing would no longer do that testing on the European wind tunnels and would take a fresh look at the American wind tunnels in terms of your testing procedure.

So I'll start with you, Dr. Tracy.

Dr. TRACY. Thank you, Senator Warner. I've spent the last 31 years of my life working on composite materials, and the reason I chose that field, in particular, to specialize in is because I did think it would revolutionize the aerospace world. And in my opinion, it has finally lived up to its potential with the 787, as we've seen today.

One of the interesting things about that, though, is it took me 31 years to see what I thought the future held 31 years ago, and

that's for the exact reasons that you're talking about. Composites still do offer us tremendous advantages in multiple industries, aviation being the best example, where you can dramatically reduce the weight which allows you to reduce the size of the engines which allows you to use less fuel, less emissions, et cetera.

The problem is the material systems are being developed faster than we can certify the new products. And so there might be material systems developed today that we won't be able to use on a future airplane—and we're developing many airplanes—because it takes so long to develop the design allowables, to run the component test, the wing test, and then full scale test.

So NASA Langley's expertise and having an industry-wide consortium of public-private partnerships—I'm very much in favor of that. And I think that could help improve U.S. competitiveness for the entire American industry by coming up with more of these modeling and simulation-based methods that does certification by analysis rather than by test.

Senator WARNER. Can I just interject a word there one moment?

Dr. TRACY. Yes, Senator.

Senator WARNER. Because we have had some conversation with the FAA and others about whether we can shrink that test time down. And it seems to me that modeling and simulation is the—since other areas have used that. I'd like you to address that for a moment. And I know my time is expiring.

Could you also touch a little bit on the challenges—as you said, this is not just for aviation. It could be for autos, and other products—how you could do the intellectual property sharing?

Dr. TRACY. Yes. The modeling and simulation is a key enabler to reduce the testing, and the testing is one of the biggest constraints, because we have to test hundreds of thousands of test coupons. The intellectual property is a concern. At our core, we believe that advanced composite materials, the manufacturing approaches used for them, the design and analysis approaches, are critical pieces of intellectual property that make us more competitive versus our foreign competitors.

So we would like to have streamlined intellectual property agreements that would allow us to share the fundamental research that we did in a public-private partnership. But certain things that we brought to the table that were specific to us—and we feel fully responsible that it's our job to make the investments to commercialize these things in a product, but there are certain aspects in the middle where we just need to be very careful that we don't lose our competitive advantage by making everything public.

Senator WARNER. Thank you. My time has expired. But I would hope to engage the balance of the panel on this topic and project as well.

Mr. SORSCHER. If I could make just a short statement, the idea of public-private partnerships is a terrific idea. I was at an engineering conference, and there was a panel where someone from Oak Ridge National Laboratory had a public-private partnership with an American company. And also on the panel was a scientist from a Chinese research institution discussing her relationship with a private business.

And I asked them what was the policy of their country, each one, about publicly-funded R&D which was then commercialized outside your country. You have a foreign partner, and the foreign partner takes the intellectual property and commercializes it in their own country.

Of course, I'm not sure what our policy is. The Chinese policy was pretty clear. They have some problems with that. There was some intellectual property that wasn't very important. They didn't care if that was commercialized outside of China, and then there was another category that maybe they'd have to think about. And then there was a category that they would be very unhappy if that was commercialized outside their country.

So Europe has more of an understanding. I'm not sure they need regulations explicitly. But, again, that's something we ought to be thinking about. Where's the reciprocity, you know? Where's the quid pro quo? We've made our investment as a country, and there's this expectation that it'll be commercialized in America. Maybe we need to be a little more explicit about that.

Senator CANTWELL. Thank you.

Senator Boozman?

STATEMENT OF HON. JOHN BOOZMAN, U.S. SENATOR FROM ARKANSAS

Senator BOOZMAN. Thank you, Madam Chair.

Senator CANTWELL. I am going to have a second round. So if members want to ask another round of questions, we'll be here.

Senator BOOZMAN. Thank you, Madam Chair. Recently, I had a young farmer in the office, and he was talking about the fact that he needed a new tractor, and this is an $80,000 to $100,000 piece of equipment. And yet he didn't feel like he could do that, wasn't going to do it, because of the fact that we're trying to get the farm bill passed. It's taking a while. It's going to take a while longer. So he just simply doesn't know what the rules are going to be for the next 5 years concerning his industry.

You know, we've heard talk of sequestration. You know, the fiscal cliff is out there. Tell me how this lack of having a tax policy—whether we disagree as to how to get that done—but how is that impacting you all as far as not knowing what to expect over the next year or two and the difference in going out a year or 2 years or 3 years? Would any of you all like to comment in that regard?

Mr. ELWELL. Senator, my boss, Marion Blakey, CEO of Aerospace Industries Association, was in a press conference yesterday about a report on what sequestration is likely to do or could do, and it's been all over the papers. Requirements of the WARN Act—it's not knowing. It's the not knowing that is requiring some of our companies, some of the members, Pete's members, our members, to have to put out notice, not knowing where the money is going to be cut and exactly how—there are legal requirements. And so our companies are taking action now. They're not waiting——

Senator BOOZMAN. So you've got that problem. But along with that, not knowing what your healthcare costs are going to be in the future, you know, not knowing what your taxes are going to be in the future—all of this is—you know, it seems to be working together to really hinder the economy right now.

Let me ask you another thing real quick that you—perhaps you, Mr. Bunce, can comment on. The overseas facilities, repair facilities—you know, Homeland Security. You know, Congress said we need some security put in place. That wasn't acted on. Congress tried to get FAA to be more responsive and basically said, I think, in 2007 that you can't certify any more until it's done, until they get the regulations. How is that affecting things as far as our ability to produce—not to produce, but to compete overseas?

Mr. BUNCE. Senator Boozman, it is significant. And, in addition to the fact that we can't open up new repair stations—and to be clear, I think the FAA will be able to implement as soon as DHS publishes the rule. So, really, the key is to get DHS to act. But what is important to note is that if we go ahead and get these repair stations up and running, it also spurs jobs back home, because people will be willing to buy the product back here.

Also, the Europeans, surprisingly, or maybe not surprisingly, are also using this now as an excuse on the ETS front, saying, "Well, now, you're causing us problems because you won't implement your security rule. Why should we not restrict our repair stations and who we're inspecting?" So it actually has international implications that DHS hasn't been able to get this rule done. And, truly, there is no controversy over the rule. It's just getting it through their legal system and publishing the rule.

Senator BOOZMAN. Very good. Does anybody else want to comment on that?

Yes, sir?

Mr. SORSCHER. I may be rewinding a little bit here. But my impression from the workplace—we've had excellent technical relationships with the FAA technical specialists. We think their demographic situation looks kind of like ours, and so we include them in this question about recruiting and retaining experienced employees.

Part of the problem with workload is having enough people. And so, again, we think that the situation with the FAA technical specialists, aside from the administrative and legal issues, when it comes time to actually do the work, they also need to be part of this attention that we're paying, generally, to getting the right number of qualified, trained, experienced people.

Senator BOOZMAN. Very good.

Thank you, Madam Chair.

Senator CANTWELL. Thank you. We're going to start the second round, and I'd like to go back to this basic question about this engineering thing Dr. Tracy talked about, what basically caught his imagination as a young person. I mean, maybe our next panel will be the private companies that are doing their own commercialization to outer space. Maybe we'll get them and Paul Allen to come and talk about their engineering needs.

But right now, we're graduating about 70,000 engineers a year, but only 44,000 of those are eligible for aerospace careers due to security issues. And I think the numbers are even more dramatic when you look at those advanced degrees. So, in fact, I think we're probably educating a lot of foreigners with advanced degrees in aviation, and they're probably going home to various places.

So how do we get more STEM educated engineers in aerospace? What do we need to do? And are we talking about starting now at the K through 12 level—is that where we need to start? Is that where we need to build the pipeline, or are there some immediate things we can do at our 4-year institutions?

So either Mr. Sorscher or Dr. Tracy.

Dr. TRACY. Senator, I do believe that it requires a system level solution that necessitates interaction at all levels. Clearly, we need more capacity and more research going on at the graduate level and at the bachelor's degree level. But the problem really starts at the elementary school level, where even in terms of just a public image that scientists and engineers have through the popular media affects young people's choices. Having the large projects to inspire them is a second choice.

But there are programs out there, and our industry is working as a whole to try and change this. There's programs like First Robotics, where we get junior high and high school kids into robotics competitions that have the feel of a high school football game that gets their interest going. I think I mentioned earlier that we're investing alone $25 million a year in the external community to try and get these young people excited.

So I do have hope, but it does require a system solution where all of us are working as individuals, talking to the young people next door from historically under-represented communities in aerospace, to the top level public policy decisions and programs. It takes all of us working together.

Senator CANTWELL. Well, I mean, we have an aviation high school in Seattle. I mean, that's one example, right? Also, the Composite Research Center at the University of Washington. I definitely think that did turn on a light bulb—having visited that several times—a light bulb for a lot of, particularly, young women who decided that composite manufacturing was very interesting juxtaposed to previous manufacturing schemes.

Dr. TRACY. One other thing we're doing—before I turn it over to Dr. Sorscher—is that this summer alone, we've brought in 1,700 interns who might not have had an interest in aviation from colleges—you know, sophomores through juniors—and we give them a chance to get their hands on aerospace products and see how these products can change the world. And, typically, most of them want to come back and be hired as full-time, and our conversion rate is about 66 percent that come in as interns and become full-time employees because they're so excited. And we have been focusing that program on people historically under-represented in engineering, women and minorities.

Senator CANTWELL. Mr. Sorscher?

Mr. SORSCHER. I would agree with everything that John Tracy just said. And I would add that the internship program is really sensational. It's one of the coolest things I've ever seen.

But to answer, my sense of the question is that we tend to think of education as being a bucket of students, and then you pour that bucket into the bucket of workers. There's actually quite a bit of dynamic that goes on. You mentioned that—I think the number is 10 percent of the baccalaureate enrollments are foreign students,

and 50 percent of advanced degree programs are foreign students. That's one dynamic.

Another is that graduates of our engineering programs don't take—many of them graduate and don't take a job in their field of study. And I think some NSF data suggests that as many as half just never make that transition from education to employment. They go into public service or business or finance or something else. There's also a fairly significant attrition in the first five or 10 years. We're not sure where people go, but, you know, they don't necessarily stay in aerospace. Maybe they take another engineering job. Maybe they go somewhere else.

And then when you look at the charts that I have in my written testimony—actually, they're much better as animations—but you can see the hiring of new students—they disappear. Where did they go? Some of them were laid off. Some years there's just very low hiring. So, again, the dynamic of, you know, what happens to students who are making that transition from education to employment has a lot of activity going on. It isn't just a bucket of students being poured into a bucket of workers.

So part of that is the business model, which I talk a little bit about in my written testimony. What kind of workers are we looking for? Are we primarily thinking about manufacturing, or is a lot of that going to the global suppliers? There are a lot of dynamic processes going on that we need to think about.

So, again, one of the suggestions we have is that we be more detailed in tracking what happens to students. Where do they go? And I think if we start looking at some of the mechanisms in there—what works and how does it work—there's a lot of detail in there that—and, again, it's different from just thinking, "Well, we'll graduate more, and then there'll be more workers."

Senator CANTWELL. So I just want to be clear. Are we doing enough? Does anybody on the panel think we're doing enough, and that it'll right itself here in a few years, or do we need to do more?

[Mr. Sorscher sent the following in reply:]

Can we do more to improve our STEM workforce?

Our instinct is to inspire children to study science, and motivate college students to pursue STEM degrees. We should do both. Education is the gateway to the labor market.

We also have policy opportunities for employees already in the STEM labor market.

First, consider the basic dimensions of the question, as measured in BLS surveys.

Employed engineers nationwide—about 1.5 million

Total employed in computing and math—roughly 3 and a half million

All domestic engineering enrollments—almost 600,000

All domestic engineering graduations—about 125,000 per year

At 125,000 graduations per year, we produce enough engineers to replace all working engineers in 12 years, assuming they all found engineering jobs, and they all stayed in those occupations.

The dynamics of the workforce are somewhat more complicated than that.

For instance, roughly half of graduating engineers take jobs outside of engineering—in finance, public service or some other occupation.

Also, foreign workers take many of the available entry-level jobs. The 125,000 engineers we graduate will compete for entry-level jobs with about 800,000 foreign temporary high-tech workers.

More and more employers see themselves as global companies, who prefer "flexible" labor practices. That means less commitment to long-term careers, more global outsourcing, more frequent layoffs, and more reliance on contractors.

This problem is acute in computing and IT professions, where many mid-career engineers find themselves unemployable. In 1996, Intel's chief operating officer, Craig Barrett, told his stockholders, "The half-life of an engineer . . . is only a few years."

In the July 6, 2012 *Wall Street Journal,* 3G Studios CEO James Kosta says, "Engineers were outliving their usefulness from one project to another. When projects end, it's better to re-evaluate your entire staff and almost just hire anew."

The labor market sends a negative market signal to students considering a STEM career. Lifetime earnings and job security can be much more attractive in non-STEM occupations, such as health care, education, finance, business, law, or public service.

On the other hand, for a foreign student, a STEM degree offers a path to permanent residency or citizenship. A STEM degree has much higher potential value to a foreign student than to a domestic student with similar abilities and professional goals.

In aerospace, the negative workforce signals from globalization are partially offset by the high value that experienced employees bring to their products. Our product cycles can last decades, unit costs are very high, development costs can be huge and learning curves are very steep. However, even in aerospace, attrition in the first five years can be 50 percent or more.

We can take two approaches to workforce management. We can encourage students to pursue STEM careers. At the same time, we can manage our existing workforce to capitalize on the investment we have already made in education and on the job training.

Ideally, the two approaches will reinforce each other. Students are more likely to invest in a career with opportunities, job security, and a clear sense of purpose.

Policy recommendations

SPEEA supports every effort to inspire young students to pursue careers in science, technology, engineering and math. We support public investment in education, R&D, and effective workforce training through apprenticeships, community colleges, and specialized programs in manufacturing.

Our policy agenda should be coherent; it should send consistent market signals to families and students, and deliver on the promise of good jobs and good careers.

In written testimony, we made several recommendations:

(1) We need a national manufacturing strategy. Japan, Taiwan, Singapore, Korea, Ireland, Israel, Denmark, Germany and India all have national manufacturing strategies. Every country in the world has a national industrial policy. By definition, our national manufacturing strategy should express our national identity, rather than a global identity.

(2) Expand our official labor market data so policy-makers have credible, meaningful, actionable data regarding the transition from education to employment. We should track how effective our programs are. How many students graduate from different programs? Do they find jobs in their field of study? Where are they employed after five years? What is the unemployment rate for recent graduates?

(3) Keep skilled workers in the labor market, with mid-career training and lifelong learning. This applies to actively employed workers and the transition from military service to private employment.

(4) Temporary foreign workers should be admitted to deal with short-term documented labor shortages. Labor shortages should be identified by occupation, industry, region, and length of time, just as they are in Canada, Australia and the UK.

(5) Internships, co-ops and coordinated public-private R&D programs should connect students to employment before they graduate.

(6) Licensing of publicly funded R&D should include conditions for commercialization in the U.S. on more favorable terms, and commercialization offshore under less favorable terms.

Items 3, 4 and 5 overlap, which prompts another policy recommendation. On the day of the hearing, the Brookings Institution released a study of training programs that are funded by fees collected in the H–1B program. The study found that training programs showed little connection to the use of H–1B visas.

This connection can be made explicit. The fees can be pooled into a limited matching fund, devoted to internships, and mid-career training in industries with a high density of workers with temporary visas. Employers can bid for the funds by demonstrating increased commitment to new and existing employees. For instance, employers could score high in their bids when they establish new paid internship programs, or when they increase their conversion of interns to full-time employees. Similarly, employers who begin life-long learning programs, or who increase participation in life-long learning programs, can bid for matching funds from the H–1B fee matching pool. Finally, the matching funds should be subject to recapture or clawback if employees are laid off within 2 years.

In the past, we inspired students with publicly funded innovative projects, or national missions, such as landing on the moon. I was inspired to consider a STEM career by elegant bridges, magnificent dams and reservoirs, and research programs that cured diseases or helped us understand the universe.

Landing on the moon, building infrastructure, and leading the world in science were national strategies. They were also a promise to students that they would have good careers. They would accomplish something for themselves and their country. Times have changed, and we will have different national strategies. But motivation and human nature are the same for our children as they were for past generations of students.

The following figures are provided for reference and to help visualize workforce dynamics over the last few decades.

Enrollments

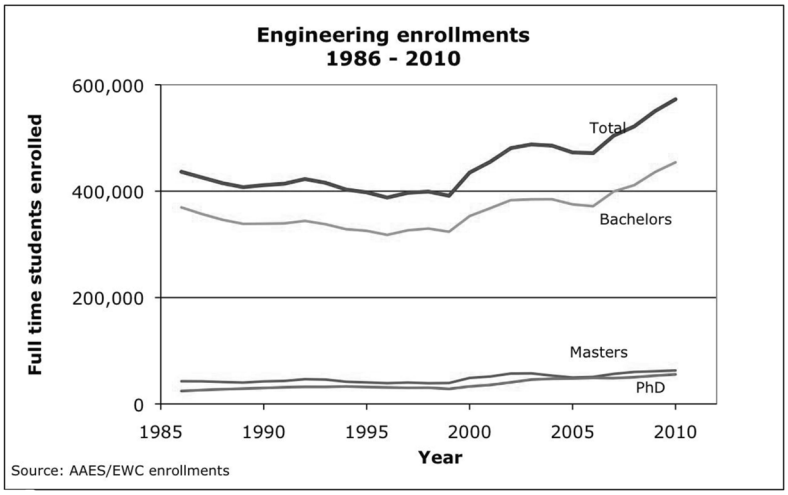

Figure 1. Engineering enrollments are generally flat, with a recent increase at the undergraduate level.

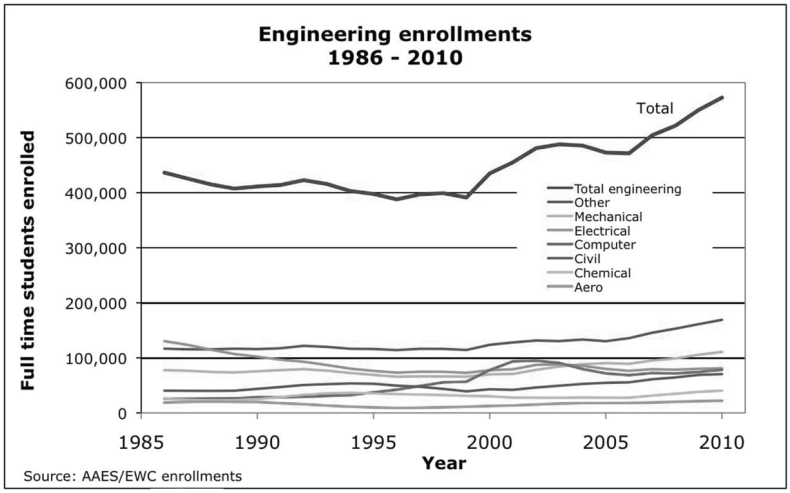

Figure 2. Computing enrollments peaked after the tech bubble.

Enrollments and graduations tend to hold to a steady level. It is relatively difficult to move those numbers up or down.

Foreign enrollments

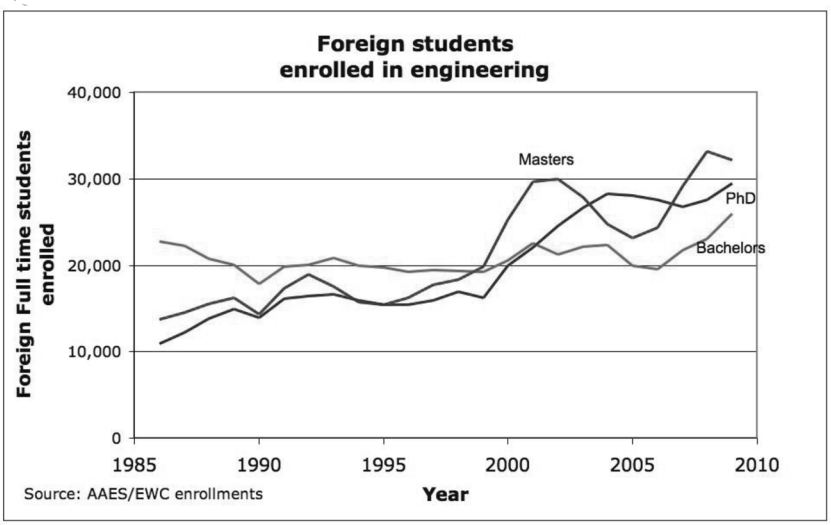

Figure 3. Foreign enrollment in undergraduate, masters and PhD programs are roughly equal in number.

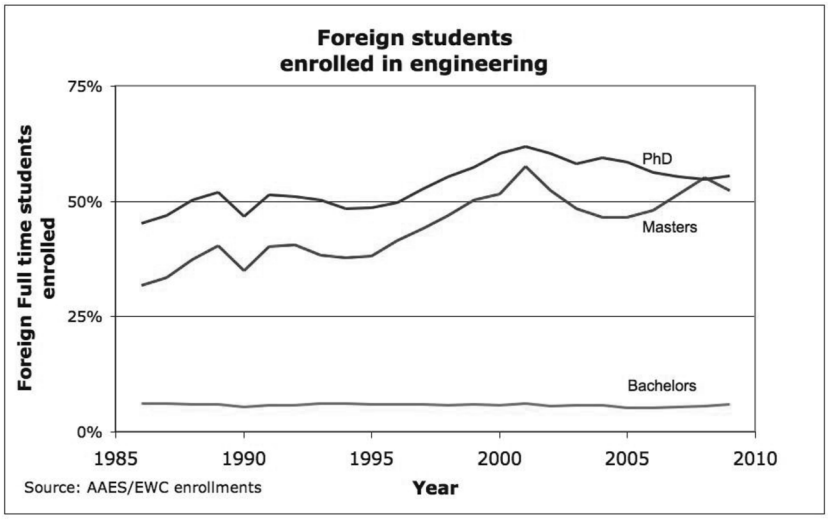

Figure 4. Foreign students make up half of enrollments in graduate engineering programs, but a smaller fraction of undergraduate enrollments.

Some foreign undergraduates go on to graduate programs, but many foreign students graduate elsewhere, then come to America for advanced degrees.

Graduations

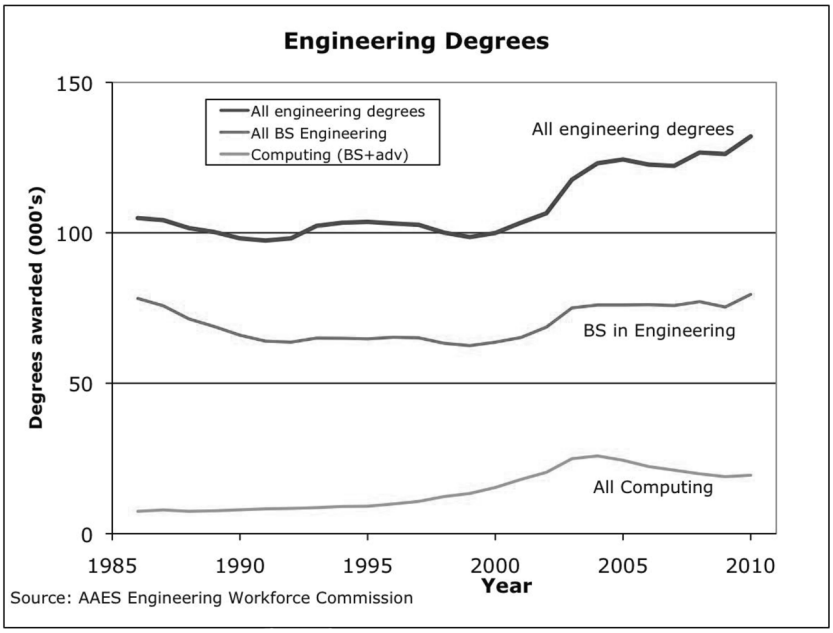

Figure 5. Combined, all U.S. programs award about 125,000 degrees per year.

Employment

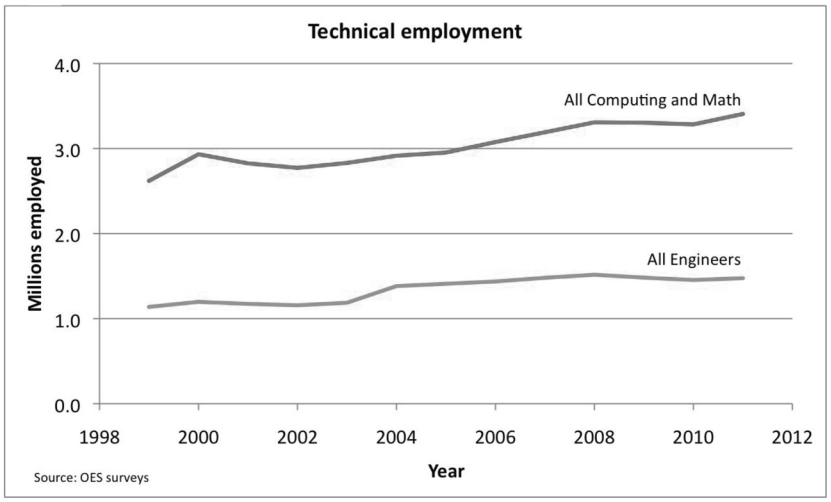

Figure 6. National employment for engineering and computing occupations is rising very slowly.

Transition from education to employment

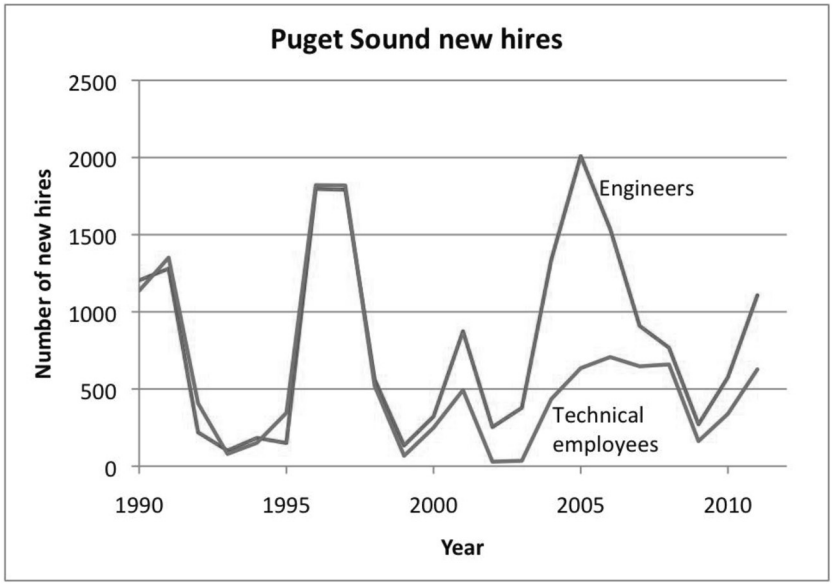

Figure 7. Education is steady-state, but demand for new hires fluctuates dramatically from year to year.

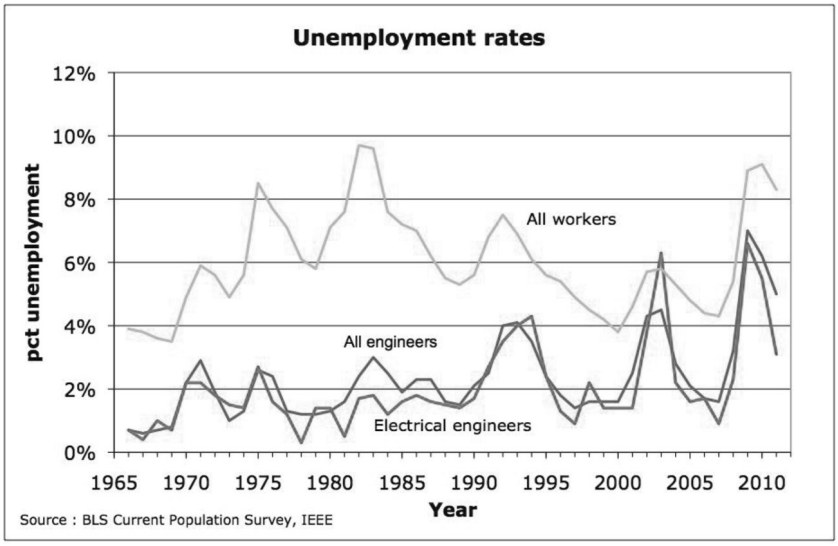

Figure 8. Engineering unemployment is generally lower than unemployment generally.

Unemployment for *recent graduates* is typically well above the unemployment rate for experienced workers. Data support the impression that recent engineering graduates face a very difficult labor market.

We use the metaphor of a bucket of students being poured into a bucket of workers. We assume that engineering graduates will find jobs in their field of study, stay in those jobs, and become more experienced.

However, data show that a large fraction of the graduating class promptly drifts out of science and engineering, moving into other occupations.

In the bucket metaphor, we spill about half the students in the transition from education to employment. The bucket leaks from then on, losing workers to other industries and occupations.

Recent graduates face two significant obstacles when looking for jobs in their field of study. First, their labor market includes roughly 800,000 foreign temporary workers, taking mostly entry-level jobs at or below market wages. Secondly, the Optional Practical Training program was recently expanded to allow foreign students to take long internships, giving those foreign students preferential status when applying for full-time positions.

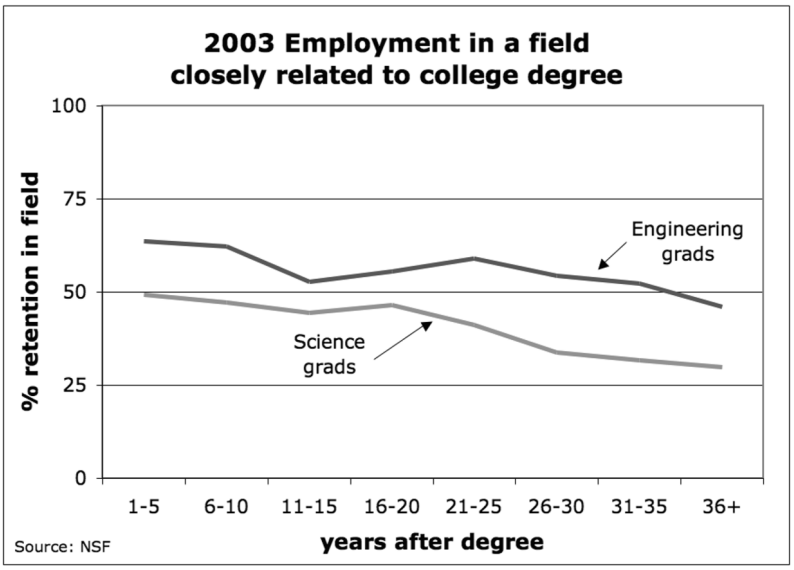

Figure 9. Immediately after graduation, many students do not find jobs in their field of study.

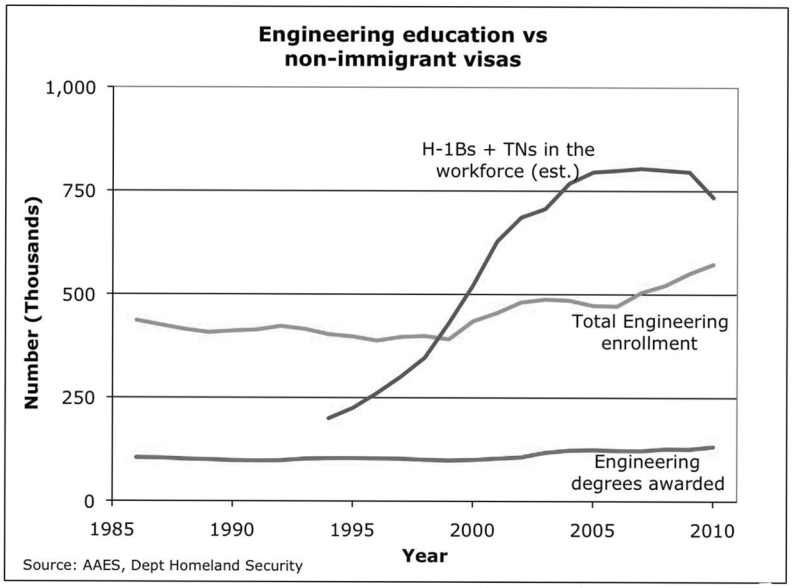

Figure 10. Foreign temporary high-tech workers greatly outnumber graduates of all domestic engineering programs.

The figure does not include roughly 40,000 H–1B workers legally overstaying their 6-year visa while pursuing citizenship, nor does it include tens of thousands of foreign students in the OPT program.

Attrition

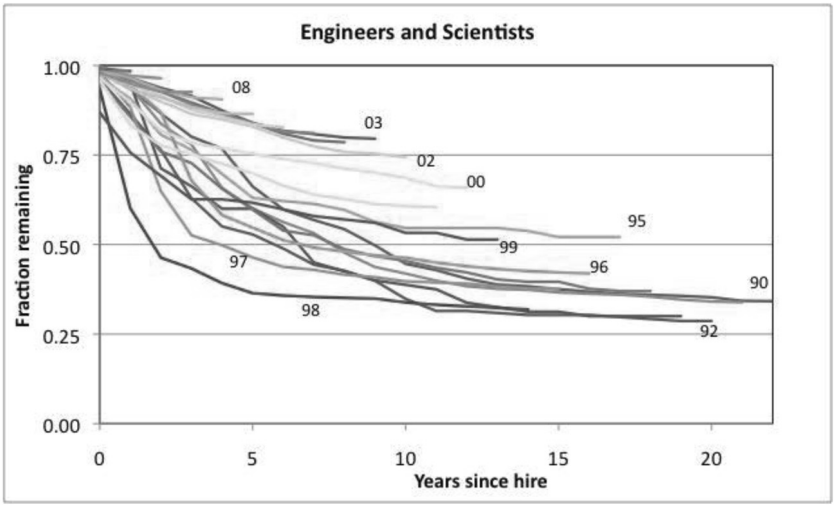

Figure 11. Attrition for SPEEA-represented engineering and scientists, measured from their date of hire.

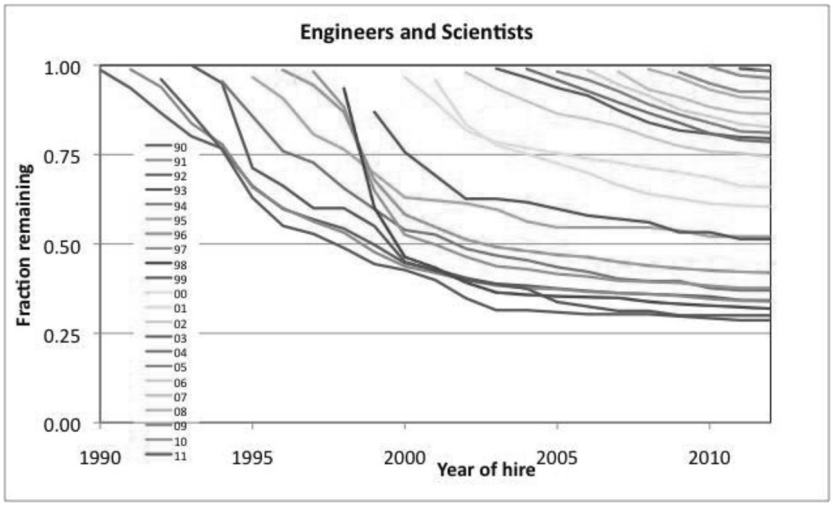

Figure 12. Attrition, measured over time, for different cohorts.

These two figures show the same data, formatted in two ways. The upper figure shows each year's new hires, as they progress through the first years of their career. The lower figure shows the fraction remaining over time, rather than time since hire.

Of those who take jobs as engineers, attrition over the first 5 or 10 years can be half or more.

Demographic shifts

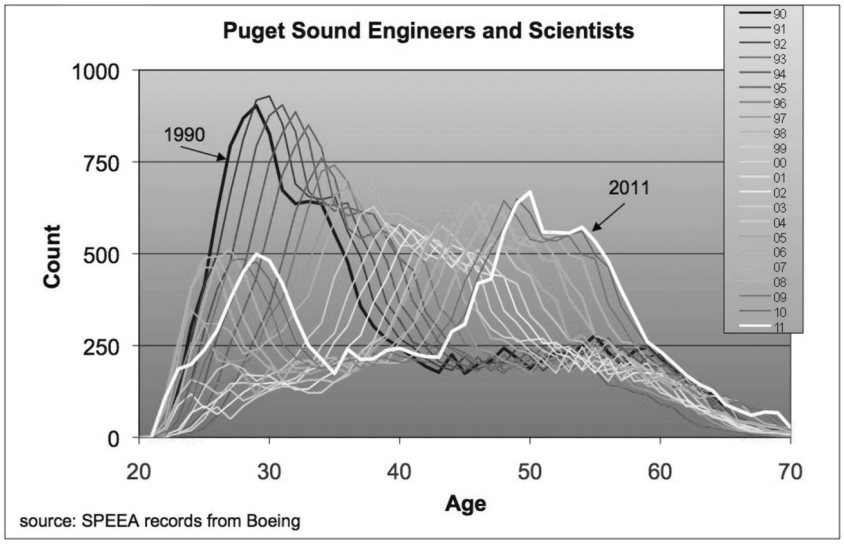

Figure 13. Age profiles for engineers and scientists shift over time from 1990 to 2011.

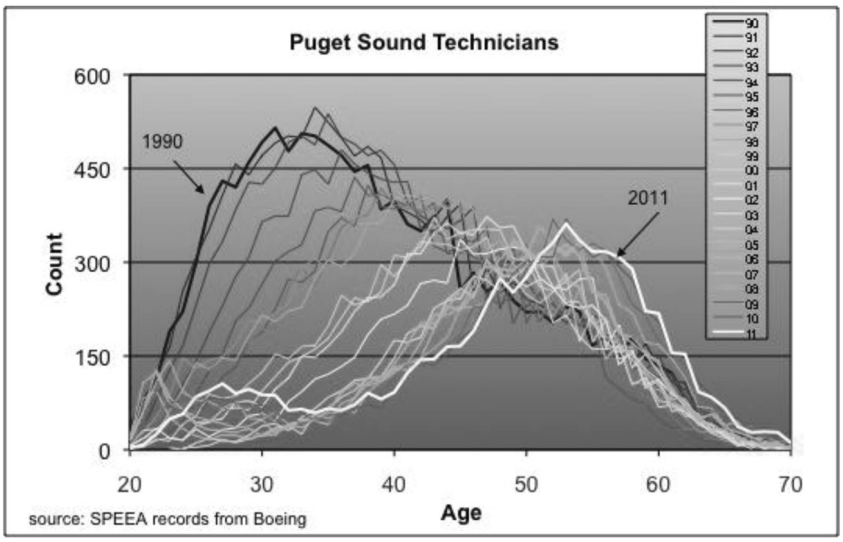

Figure 14. The age shifts for technical employees are more pronounced than for engineers and scientists.

These figures show the steady development of our demographic problem in aerospace. In 1990, the engineering population was heavily weighted toward young people. Over the next two decades, we attracted many new engineers, but some were laid off and others resigned, without being replaced. Employees are eligible for early retirement at age 55.

Some of this shift is the consequence of changing from an integrated design and manufacturing business model to a globally integrated business model.

In 1995, when senior executives said, "These jobs are going away and not coming back," they meant that manufacturing will move out into the global supplier base, and we will need fewer engineers working on detailed parts, subassemblies, software, and electronic systems. Instead, we will need system integrators, project man-

agers, and a small group for product development. Research and development will generally follow manufacturing out into the supplier network.

In that sense, our demographic situation is a problem of our own making.

To some extent, the 787 program reversed that trend.

The situation for technical employees is much more dire. For that population, a large bow-wave of older employees is approaching retirement. The cohort of new technical employees is very small.

Mr. SORSCHER. First of all, we'd love to do more, right? We think this is a great industry. It's a great career. It would be irresponsible for us to encourage families to make this extraordinary investment and not have good jobs for them when they get out. So this is a very volatile industry. There are some years when, you know, we need 2,000 people, and there are some years when we need 175. So I think that might be why a lot of the graduates don't go into engineering. A lot of times, there's a problem getting from education to employment. So we need to think about that more carefully.

I certainly believe that there is a systematic approach where we can be more efficient in the way we capitalize on the social investment we made in education going into employment. Education is a very steady state. If you look at the enrollments and graduations, it takes quite a bit to move that number up and down. Employment is much more volatile.

Senator CANTWELL. Well, I'm not so sure we don't need a poster that says, "Uncle Sam needs you," because if we're talking about this sector being such a huge employment sector for the United States and the growth that we're seeing around the globe, this is where job creation really is. And so we can be the leaders in it, or, as Mr. Calio said, wait and find out that we'll be like the maritime industry, and somebody else will have driven, the innovation and driven down the cost. The thing we have going for us is—just as SPEEA does—that engineering brain power that can be well educated and continue to innovate and keep us ahead.

Mr. SORSCHER. I'm all for that. And, again, there's just that quid pro quo, that reciprocity. I just look at what happens to each year's new hires. The internship program is really cool. We bring people in. Where do they go? So, again, maybe I'm not saying it the right way. But we want to hire more, and then we want to retain the ones that we have. And I think if you look at those demographic profiles, that was our problem. We didn't retain them.

Senator CANTWELL. OK. Good.

Senator Lautenberg?

Oh, Mr. Bunce, did you want to make a comment on that?

Mr. BUNCE. Senator Cantwell, I just want to give you an example. I was talking to one of our CEOs today, and this company is the one that put the great screens in the 787, the liquid crystal displays, heads-up display. They have an Ethernet backbone—state-of-the-art technology. Well, they're trying to take that technology and put it down into the business aviation sector. So they've got 17 different individual platforms that they can put that onto. They've got about 1,000 engineers working on it.

But what are they looking at? They're looking at the R&D tax credit. And they're seeing exactly the numbers that Mr. Elwell brought out, and in a best year, only a 6 percent return here in the U.S., or 6 cents on the dollar. You can get that much better

other places. But then even worse is our R&D tax credit sometimes is retroactive. You don't know if you're going to get it, and it's only done a year at a time.

So I would ask that when you take on this giant gorilla of tax reform, and especially looking at the manufacturing sector, for engineering within aerospace, this R&D tax credit is a fundamental element that's very important to us.

Senator CANTWELL. Thank you. Very well made point.

Senator Lautenberg?

Senator LAUTENBERG. Thank you, Madam Chairman.

Mr. Bunce, if we can just review an area that I think you were kind of leading us with, the repair stations abroad, what happens exactly if a country has its own investors, and they want to open an FOB, if you could call it that, or a repair station? What happens before that station can be of use to our airlines?

Mr. BUNCE. If the aircraft is FAA certified, to be able to work on that aircraft, then we have to be able to—according to the laws that have been passed, we have to have that certified, and so no new station can be opened up. So it greatly impacts Mr. Calio's folks out there to be able to have these aircraft serviced in a worldwide network.

So if we have these expanding markets, which we're very happy to have, whether they're in the Asia Pacific region or Latin America or Africa, we've got to be able to have a repair station that's close to home, because the worst thing is we've got to fly that airplane all the way back—especially if it's used domestically in China, to have to fly it all the way back here to work on it. Folks just aren't going to do that.

So we really need to be able to open up a global network of repair stations. And, obviously, we have to have them secure, and the TSA has already come up with a plan to make them secure. We've just got to get the rule out, and then let the FAA——

Senator LAUTENBERG. So how much of a delay is there because of the security concerns?

Mr. BUNCE. Well, Senator, it's not a matter of delay. We cannot open up new repair stations right now until they get this rule out. So existing ones can still operate, but we are not able to open up new ones until they get this rule.

Senator LAUTENBERG. Now, is the "we" talking about strictly American-owned operations, or are we talking about foreign operations? There are lots of countries where we would use these repair stations if they're qualified.

Mr. BUNCE. Sir, again, it's where we have an FAA production certificate. And that's where it changes a little bit. So let's take, for instance, in my industry, Embraer, a great company out of Brazil. They've opened up production facilities in Melbourne, Florida. When they start producing aircraft there, they'll have an FAA production certificate.

We have Dassault that has more jobs in Little Rock than they actually have back in Bordeaux. We've got Bombardier that has the Learjet facility in Kansas, so they're a Canadian company that has a great facility in Kansas, and they have an FAA production certificate.

Senator LAUTENBERG. Well, I hear the business is fairly robust. The people I've talked to who operate a couple of these things—they say that business is really good and picking up, and they're in far away stations. And so it sounds like the business is pretty good with the population of these facilities that we have. Are there enough out there to take care of the current needs and the expected future requirements?

Mr. BUNCE. Absolutely not, especially in the markets where we want to go. So right now, Europe is hurting, just like the North American economy. So when you look at what our traditional markets were, it was North America, and about a quarter was Europe. That's all dynamic—has changed now. And our growth is going to be in Latin America and in the Asia Pacific region and then down in Africa. So that's where we've got to be able to have these new repair stations so that people want to buy those types of aircraft.

Senator LAUTENBERG. In Asia and Latin America and those areas, the requirements are not being made rapidly enough? I threw Asia in there. Is that true?

Mr. BUNCE. Right. We're not able to open up those—we're not able to put in new repair stations to service registered aircraft——

Senator LAUTENBERG. Because of the American requirement?

Mr. BUNCE.—because of the rule.

Senator LAUTENBERG. Mr. Calio, one of the things that hasn't been discussed here is how we can help the process, from an operating standpoint, improve pass-through times. Now, for instance, according to reports from Newark Liberty, arriving passengers are experiencing long waits at Customs. A busy travel season is on the way. There are concerns that wait times will continue to grow. Are you aware of whether or not Customs is providing adequate staffing at Newark?

Mr. CALIO. Senator, I think across the board at all the major gateways, like Newark, like Miami, like Los Angeles, like Houston, there are problems with CBP staffing and the time it takes passengers to get through. The waits—you know, some 45 minutes. You mentioned an hour—sometimes much longer than that.

It's suppressing travel and tourism here. It's suppressing business travel here, because it, frankly, is just not worth it. And there are significant problems that I think CBP is trying to work through, but they need to be worked through on a faster, real-time basis, because it is having an impact on the entire industry across the board. And there's that kind of daisy chain of, you know, less travelers, less airline business, less service. So something needs to happen there.

You know, they move people around to try to match peak hours. But the system is not working right now. One thing that I would be remiss if I didn't bring up is the notion that we're now putting in—or DHS would like to put in play this pay-for-play scheme, and so we're going to open up a center in Abu Dhabi, because Abu Dhabi is going to pay for it. CBP will staff it. Meanwhile, there's not a single American carrier that transits through Abu Dhabi. So they need to put their resources where they do the most good, and in many cases, that's our major gateways, like Newark.

Senator LAUTENBERG. Are you aware whether immigration cases or examinations are mixed in with Customs reviews? Are they sep-

arate in most airports so that one is a much faster operation than the other?

Mr. CALIO. I don't know that one is faster. I'm not sure if they're mixed together. But I think in terms of the immigrations—and if you're looking at visas, in many cases, we've got significant delays there, too, which is also suppressing the travel to this country.

Senator LAUTENBERG. Because one of the things that we see happening is that there are fee revenues being developed for different services—where do you want to sit, do you want to eat, do you want this, do you want that? And so the airlines, in my view, have picked up revenues. Now, whether they've got enough volume because of the number of passengers is another question. But having these services unavailable without selling them directly has, I think, inured well for the airlines—lots of new revenues.

But we're hearing a lot of complaints from the traveling public about these things and about the notion that you're going to have to go through a dial-them-up kind of reservation to find out whether or not—or when their seat is available, and on what row. There are places and times in our lives when if there are crowds, the crowd just goes in and first come, first serve, and that's the way it is.

And now I'm fearful that one of these days an airline will want to charge for an opportunity to go to the lavatory and what kind of a charge might be imposed for that kind of facility. Because almost everything else now is being put on a separate bill, and it is creating maybe more revenues, more income for the airlines. But I don't hear them saying, "Hey, this is really good for us." But what I do hear is, "Wow, what else must we do?"

They're putting more passengers in, with less sitting room, less comfort in the airplanes. What's happening? Is there just a reduction in air travel that eats up these extra revenues and it doesn't fall to the bottom line?

Mr. CALIO. Senator, put it in context. The ancillary revenues that you're talking about constitute only 4 percent of our total revenues. That 4 percent has helped us make a profit in the last 2 years after losing billions and billions of dollars before that. We are, as we do this, acting like any other business in unbundling our product and giving consumers choice of an attractive base fare, and then they can pay for what they like or what they don't like.

You know, baggage fees, as an example—many passengers, like me, like to carry my bag on the airplane, and we're permitted to. We've had the same policy in place for 20 years now—the same carry-on allowance that you had before. I don't want to be away from my bag, so I carry it on.

And, you know, if someone wants to pay—so if we put that into the base price and don't charge for it, despite the fact that we pay multimillions of dollars every year for the infrastructure and the labor and the fuel to move those bags from Point A to Point B, then I don't have a choice. I subsidize other passengers.

And it's like any other business. In cable—cable is not forced to provide premium service to everybody. They give you the base service, and then you add onto that service.

Senator LAUTENBERG. And you weren't locked into a cabin. You weren't strapped in your seat. You weren't waiting in a line for var-

ious inspections. The traveling routine has become more cumbersome, and the revenues per passenger have gone up. The question of whether there are enough passengers is another thing we're not reviewing here.

Senator CANTWELL. Thank you. I want to move on. I certainly appreciate your leadership.

Senator LAUTENBERG. I'm sorry.

Senator CANTWELL. No, Senator Lautenberg. You've done a good job.

Senator LAUTENBERG. I found my questions so interesting I just couldn't stop.

[Laughter.]

Senator CANTWELL. Well, I have found your past leadership on banning smoking on airlines a great service to our country. So, anyway, we're going to move to Senator Thune. So thank you.

Senator THUNE. Could we add leg space for tall people to the Senator from New Jersey's list of——

Mr. BUNCE. Senator, I would agree with that.

[Laughter.]

Senator THUNE. Two quick things, and the panel can respond to them. But the Finance Committee today voted to report out permanent normal trade relations with Russia. And that's something that I know Boeing took, I think, a public position on. But I'm just curious as to why—you know, maybe you could elaborate on that—why it's important.

And then, second, the so-called fiscal cliff, which includes a sequester, which we've talked a little bit about, but also tax increases that occur on January 1 of next year —what that might mean, not only to your operations or those you represent, but also just the impact on small businesses. How many small businesses are sort of in the chain, so to speak, the supply chain of the various manufacturers, airlines, I mean, right down the list? It seems to me, at least, there are a lot of small businesses that would be impacted.

When we talk about jobs, we talk about the large employers, obviously, but also there's that ripple effect that goes out throughout the entire economy, which I think impacts a lot of small businesses. So maybe the first question on PNTR, and the second question dealing with the issue of the fiscal cliff, the impact of the sequester, and increasing tax rates on small businesses that might be a part of that supply chain.

Whoever?

Mr. ELWELL. Senator Thune, that's good news, PNTR, and the position on—I'm assuming you mean the repeal of Jackson-Vanik.

Senator THUNE. The repeal of Jackson-Vanik, yes.

Mr. ELWELL. Well, that's very important, because now, with Russia in WTO, we're not going to have to—Boeing and any of our companies are not going to have to deal with higher tariffs when it competes with other countries, and so I think that's great news. And for global competitiveness, you don't want to have some steep tariff added to your product—so with regard to that.

And your point about small business and sequestration I think is a very good one. Clearly, if the big companies are letting people go or have to let people go, if we're making these huge cuts on the defense side, for instance, all these primes have hundreds and hun-

dreds of suppliers which will be undoubtedly negatively impacted by the reduction in the primes and the OEMs. So the ripple effect is going to be huge.

And on the civil side, there will be a report coming out in August that examines the very question we were talking about earlier, about the different scenarios of sequestration to, specifically, FAA and the civil aviation industry at large—that ripple effect you're talking about and what it's likely to do. So that ought to be out within about 3 or 4 weeks.

Senator THUNE. I'd be interested in seeing that.

Dr. TRACY. Senator Thune, I echo Mr. Elwell's comments on PNTR. I'd also like to mention that with respect to small business, just our company alone has over 8,000 small business partners where we spend $4 billion a year. We're quite concerned that under sequestration, they might not have the robustness to carry them through any perturbations into their normal business plans that they were counting on. And so this is a concern for us, because it takes all types of suppliers, large suppliers, small suppliers, to have a healthy ecosystem and keep coming up with innovative ideas for our products and services.

Mr. BUNCE. Senator, I would just add that with sequestration, as we look toward the effects, one of the things is certification officials at the FAA are not considered safety critical. So if they're going to make some cuts—and we've already talked about potentially pushing NextGen way out in cutting the operations account—if you go ahead and stop the certification activities because of budget constraints, then our small business suppliers that were just talked about—they are on the end of that whip, and the amplitude of that whip gets really big out there. The smaller they are, the less capability they have to cover if there is some kind of stop, because there are no certification officials to be able to get the product through the system.

Senator THUNE. Madam Chair?

Senator CANTWELL. Thank you.

Senator THUNE. I'm sorry?

Mr. SORSCHER. I had just a very short thing to say about PNTR. If PNTR and WTO were only about tariffs, that would be great. The tariff part, we think, is to our advantage. But it's actually a much more complex situation than joining the WTO or not and tariffs. Russia is very comfortable with offsets and other arrangements that help build their aerospace industry. And when you look at, again, some of the complexities of the national policies that other countries are using, that, I think, is what we think has the greater leverage.

So in my testimony, I talked about what we should have is a national manufacturing strategy. I think that part of it is where we have a lot of potential. So, again, it's kind of confusing sometimes when you think about, "OK, Russia goes into the WTO, and that's a good thing." Actually, the dynamic there, we think, is a lot more complicated. So we're thinking about what can maximize our potential for our domestic industry, and we start with sort of a manufacturing strategy, and then the trade strategy would follow out of that.

Senator CANTWELL. Thank you.

Well, I want to thank the panelists for their testimony today and for all of your input. We'll leave the record open for two weeks in case anybody has any other questions or information that we want to get back. I appreciate everybody's covering of a wide cross-section of issues.

I certainly, as Chair of this subcommittee, plan on making sure that NextGen implementation is a big focal point and making sure that that does go smoothly. I think seeing the greener skies already implemented in various places in this country is helping us with huge savings. So that's something very positive, along with streamlining the FAA process and this larger education issue. The good news is there's great opportunity. The challenge is we need to continue to innovate to meet it, and we're certainly going to play our part here in doing so.

So thank you all very much. We're adjourned.

[Whereupon, at 4:45 p.m., the hearing was adjourned.]

A P P E N D I X

PREPARED STATEMENT OF HON. KAY BAILEY HUTCHISON, U.S. SENATOR FROM TEXAS

Thank you Chairwoman Cantwell for convening today's hearing. I would like to also thank the witnesses for their participation.

The aviation industry is a critical engine for job creation in the United States, supporting over ten million jobs and contributing $1.3 billion in total economic activity. Last year, almost 800 million passengers and $562 billion in freight value were flown safely in the United States. Our aviation manufacturers contributed a $75 billion net positive impact on our worldwide trade balance and represented the top U.S. exports for the past decade.

But as critical as the aviation industry is to our economy the U.S. airline industry is facing strong headwinds particularly with highly volatile fuel prices and increasing tax burdens both at home and abroad.

I would like to highlight a couple of burdens faced by the industry and urge my colleagues to consider that impact on our carriers' competitiveness and ability to create jobs.

For instance, as discussed at a Committee hearing in June, the European Union is implementing an emissions tax on U.S. air carriers with its unilaterally imposed Emissions Trading Scheme. The European scheme violates U.S. sovereignty by imposing a tax on routes flown by U.S. airlines over U.S. airspace, far outside of European airspace.

I would like to commend Senator Thune for taking the lead in fighting this scheme. Together with Senator McCaskill he introduced a bill to protect the U.S. aviation industry from the harmful effects of Europe's emissions tax and I am proud to be a cosponsor of their legislation. The House has approved legislation and it's now the Senate's turn to protect American passengers and carriers from Europe's emission tax.

In addition to harmful international taxation abroad, airlines are mistakenly thought of as a tax revenue generator by some here in the United States.

Airline passengers pay taxes that are proportionately higher than the "sin taxes" on alcohol, tobacco, and firearms. The industry's Federal tax burden on a typical $300 domestic round-trip ticket has tripled since 1972, from $22 to $61.

In the midst of such a challenging time, the government is not making it any easier on the American passenger.

President Obama proposed an increase in the passenger security fee in his 2013 budget. The fee would disproportionately affect low-cost carrier operations and would increase government taxes on 300 million travelers.

These proposed tax increases could not come at a worse time as the airline industry struggles to remain profitable amid skyrocketing fuel costs. The industry posted a $1.7 billion loss in the first quarter of 2012, wiping out the meager $500 million profits for all of 2011.

Whether imposed by our own government or by foreign governments, unfavorable aviation tax policies hurt our carriers' ability to compete around the world and create jobs. It's time to stamp out any proposals to increase the already high tax burden imposed on the aviation sector.

I look forward to hearing from today's witnesses.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO DR. JOHN J. TRACY

Question 1. Apprenticeships Programs for the Manufacturing Workforce—Dr. Tracy, I know Boeing continues to actively work with Washington state educators, government, industry, and its employees to create a pipeline of skilled workers to meet its current and future needs. For example, your company has operated a decades-old apprenticeship program with the International Association of Machinists. They call it the original four-year degree.

To meet Boeing's increasing production rates, your supply chain will also need to have an equally skilled workforce. When Boeing is hiring, I am told that frequently the first place the company looks for new workers is its suppliers' experienced employees. For this reason, some of smaller aerospace suppliers in Washington tend to pay a lower starting wage and under-invest in training.

Why do you believe Boeing's existing apprenticeship program has been successful in providing one path to a skilled manufacturing workforce?

Answer. Because Boeing is known for offering among the best pay and benefits for this type of work, skilled employees or professionals from other companies or suppliers may apply for and obtain employment with Boeing. Due to the company's size, the wide range of skills needed in our various businesses and the geographic diversity of locations, the company takes several different approaches to train and develop a skilled future workforce at Boeing.

In Washington State, Boeing trains and develops its skilled workforce and plans for the future workforce several ways:

- The IAM/Boeing Joint Programs Apprenticeship Program, a partnership between Boeing and the International Association of Machinists (IAM District 751), working in conjunction with the state apprenticeship councils, gives current Boeing employees the opportunity to learn all aspects of their chosen trade through hands-on experiences and trade-related classroom instruction. During this four-year program, apprentices work full time in their chosen trade, learning the latest technologies in the aerospace industry.
- Boeing partners with community and technical colleges to develop a pipeline of workers trained in cutting-edge aerospace manufacturing skills. With assistance from the Washington Aerospace Training and Research Center—a collaborative initiative between the aerospace industry and Washington State—Boeing has created recruitment, pre-hire and workforce training programs in aircraft assembly and fabrication, maintenance and other skill areas critical to building aircraft. Students attending these courses can earn pre-hire certificates to prepare themselves for Boeing and other aerospace jobs.
- The Boeing Commercial Airplanes Aerospace Academic Alignment Team partners with IAM/Boeing Joint Programs in Puget Sound to promote awareness and develop manufacturing career paths that expose high school students to the aerospace industry through hands-on and experiential learning. High school skill centers in Washington State are beginning to offer these programs today with more planned for the future.

Question 1a. What do see as some of the key challenges in trying to establish apprenticeship programs at the smaller companies that make up your supplier base?

Answer. The geographic diversity in Washington State prompted the Aerospace Joint Apprenticeship Committee (AJAC) to develop and deploy the Advanced Inspection and Manufacturing Mobile Training Unit. This 53-foot classroom on wheels provides advanced aerospace training for suppliers in rural areas and other parts of the state not served by this advanced training. Skilled instructors provide modular training in the entire manufacturing process, from product design to inspection. The Mobile Training Unit introduces new machinery and trains employees on equipment not currently available at the company worksite.

The Mobile Training Unit is the brainchild of the Aerospace Joint Apprenticeship Committee (AJAC), which is the result of Washington State developing on-the-job training programs to instruct workers in the aerospace industry. The AJAC committee is comprised of industry employers, employees, and the International Association of Machinists and Aerospace Workers (IAM) and has equal representation from different segments of the aerospace industry.

Question 2. NextGen—Dr. Tracy, NextGen will bring a number of benefits to airlines, passengers, the environment, and communities surrounding airports. In the near term, airlines will be able to implement precision navigation through existing technology combined with procedures developed and demonstrated in Greener Skies over Seattle pilot, of which Boeing is key participant. One of the key challenges I see with NextGen implementation is that there will be a period where there will be mixed navigation equipment—that is to say some aircraft at an airport will be NextGen enabled and some will not. These precision procedures are developed in conjunction with an aircraft's flight management system. For newer aircraft, I know that Boeing has given a lot of thought to it. As you point out in your written testimony, newer Boeing planes are already equipped with NextGen avionics equipment.

Are there certain models of Boeing aircraft that do not have a sophisticated enough flight management system to accommodate Required Navigation Performance and other aspects of NextGen?

Answer. All new Boeing aircraft flight management computer systems are capable of supporting Required Navigation Performance (RNP) and many of the other aspects of NextGen that have been defined to date. With respect to navigation, many of the existing in-service Boeing aircraft have flight management systems that can support Area Navigation (RNAV), which is a less stringent variant of RNP but can be effectively used to reduce fuel consumption and environmental emissions if the procedures are put in place to accommodate. The FAA has demonstrated this in Atlanta and Dallas and is working to deploy it elsewhere.

A subset of the existing inventory of Boeing aircraft is equipped with higher-precision RNP capability that enable operations in more demanding applications and instrument conditions. Boeing is working with the FAA to implement RNP in Seattle where a high percentage of airplanes flying in and out are equipped and the weather if often less than optimum.

With regard to other aspects of NextGen, the complex mix of possible operational improvements, essential technologies, and differing implementation schedules are such that only some of the envisaged near term NextGen improvements, such as Tailored Arrivals, will be possible with the same flight management system containing RNP capabilities. Other parts of NextGen such as 4D Trajectory Based Operations in the far term will require software and/or equipment hardware changes in order to provide the needed aircraft capability and performance.

Question 2a. How do you think the NextGen program best handle these legacy aircraft?

Answer. Because of the large numbers of aircraft with legacy capabilities, NextGen should initially place some emphasis on the transition to advanced ATM operations. In the beginning, mixed fleet operations will need to be managed and reasonable accommodation of legacy aircraft will need to be part of the implementation planning. The NextGen program planning should reflect this through aggressive steps that move out to implement RNAV procedures across all congested airports within the National Air Space (NAS). In addition the NextGen program should work with airlines to develop a detailed implementation road map for the more capable RNP procedures and a Green Lane concept that will advantage Airlines who invest in the new NextGen avionics equipage. This road map will enable Airlines to close the business case for investing in the equipage, thereby accelerating the number of capable aircraft in the inventory and enabling more efficient flight routes and higher capacity across the NAS.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. AMY KLOBUCHAR TO DR. JOHN J. TRACY

Question. Minnesota has a thriving aviation industry. In fact, GAMA members, three of which have headquarters in Minnesota, support over 2,600 direct jobs in my state. Additionally, we have tens of thousands of general aviation, commercial and cargo pilots who reside in the state, as well as the 12th busiest airfield in the U.S. The Minneapolis-St. Paul Airport alone supports 17,000 jobs. All of these jobs and more are dependent on the competitiveness of the U.S. aviation industry from manufacturing to passenger and cargo services. How are you, or your members, working to ensure aviation related and supported jobs stay in the U.S.?

Answer. Despite significant cuts in defense spending, Boeing has hired more than 15,000 workers over the past five years. Total employment at Boeing at the end of July stood at 174,675. Ninety-four percent of those jobs were in the United States, and those figures tell only part of the Boeing jobs story. In 2011 Boeing spent more than $40 billion with 18,500 businesses across the United States—expenditures that supported an additional 1.3 million supplier-related American jobs.

Boeing does not project future employment figures, but we expect the recent positive hiring trend to continue due to strong global demand for our products and services. At the end of the second quarter, we had commitments from the world's airlines for 4,000 commercial airplanes, and a total order backlog (commercial, defense and space) of $374 billion.

Going forward, the key to sustaining and growing U.S. aerospace jobs is continued success in global markets for companies like Boeing. Numerous other countries have their eye on the U.S. aerospace business. New competitors are emerging in China, Russia, Canada, Japan and Brazil. However, we are confident we can meet and beat the new competition, with broad economic benefits to the United States and its workforce. We are making substantial investments in new products like the 737 MAX, in worker training, and in new plants and equipment. In 2011, for example, we opened a major new final assembly plant for commercial airplanes in North Charleston, SC, and just recently we opened a new parts processing center in Port-

land, Ore. We also continuously work to stay cost-competitive through improved productivity.

While Boeing is doing what it needs to do to position itself for success, it is important to note that government also must take steps to help companies like Boeing compete successfully and sustain American jobs. Companies that design and produce high-tech products and services need workers skilled in science, technology, engineering and math. We can, and will, do on-the-job training, but it is essential that America's schools graduate students with the basic skills and knowledge needed to sustain high-tech jobs.

Robust, long-term government research and development programs also are important to maintaining America's leadership in aerospace and other high-tech industries. Private-sector companies cannot afford to support R&D efforts that offer little, if any, return on investment for 20 or 30 years. Only the government can sponsor such research, and the record is clear that when it does, it often lays the groundwork for major new products and industries and the jobs that they support.

In addition, reasonable tax and regulatory policies are important to keeping businesses and jobs here in the United States. We recognize the need for both taxes and regulations, but a proper balance must be struck to ensure U.S. competitiveness.

Likewise, government enforcement of trade agreements is essential. Boeing's chief competitor—Airbus—has been highly subsidized by governments in Europe since its inception more than 40 years ago. The Office of the U.S. Trade Representative has been successful in challenging those subsidies before the World Trade Organization. However, European governments have yet to comply with that landmark ruling. The USG must ensure they comply, not only to level the playing field with Europe's Airbus, but to set clear ground rules for emerging competitors in other parts of the world.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARK WARNER TO DR. JOHN J. TRACY

Question 1. Dr. Tracy, you mentioned that your industry invests billions of dollars every year in research and development (R&D). You further mentioned that it is difficult for companies in your industry to invest in R&D programs that will provide little-to-no return over a 15–20 year period. Who do you think should take on the role of long term R&D projects in the aviation and aerospace industries?

Answer. There is no one entity that should be solely responsible for long-term research and development projects in the aviation and aerospace industries. Rather, such efforts need to be undertaken collaboratively between government agencies, university researchers, and private sector R&D programs. Basic research in most areas can apply to a wide variety of different industries and applications, meaning that all research entities in the United States have significant roles to play. The development of carbon fiber composite materials that I described in my original testimony is a perfect example of the importance of broad-based investing in research and development. The basic scientific research underpinning carbon fiber composites was supported by Federal investments, which laid the foundation for their eventual use in aerospace applications. We have long-maintained that commercialization of technologies and applied sector-specific research is the responsibility of the private sector—but such long-term investments are extremely difficult to maintain without broader support for basic research throughout the domestic scientific community.

Question 1a. What role do you see the National Aeronautics and Space Administration (NASA) as having in long term R&D projects?

Answer. As we have learned within Boeing, it is important to have a critical mass of investment to be able to accomplish technical objectives in research activities. We believe the research we see NASA performing and the way it is investing as appropriate for the funding levels it currently has. This fundamental research is the seed corn that forms the basis for next generation capabilities. Ultimately, the commercialization of aeronautics knowledge into products and services that serve the market is the responsibility of private industry. NASA has played an invaluable role in encouraging and helping to fund the development of a foundation of knowledge that can then be leveraged by industry to serve the public. For instance, NASA, like its European counterparts, has been funding critical foundational research into automating the air traffic management system with the goal, among other things, to increase safety and decrease the environmental impact of aviation. That kind of research, which only NASA can accomplish, is critical to future of the air travel and of our planet. It's critical, of course, that collaborative NASA and industry research activity be consistent with the obligations of our trade treaties, but there is much valuable work for NASA to promote within those bounds.

Question 1b. What are your feelings on the possibility of a joint public-private partnership focused on long term R&D projects such as research on advanced composites? Given the rich history of aeronautics research at NASA Langley, do you think that facility should play a role in such a partnership?

Answer. Boeing would welcome joint public-private partnerships on long term research projects, not only in advance composites but in a variety of other research fields as well. Provided that clear frameworks are established for any such proposed initiatives that govern the use of intellectual property and other technical aspects (discussed further below), such collaboration can be extremely beneficial for advancing innovation. In addition, a public-private partnership would enable all those involved, including both the government and the private sector, to maximize the return on their investments in these areas, and ultimately make participation in joint partnerships more attractive. We agree that NASA Langley has a rich history of aeronautics research, and its work has significantly furthered the industry with countless valuable developments. We would look forward to continuing to work closely with NASA in this regard.

Question 1c. What potential challenges do you see in the creation of such a partnership, and how would you propose addressing those challenges?

Answer. As I mentioned in my original testimony, collaborative frameworks for joint partnerships and initiatives, if not established with adequate foresight and consultations, can be vague and unfocused, leading companies to question the value of participating. A significant challenge in this regard is providing clear objectives and goals for a partnership, while still maintaining enough flexibility so that companies can tailor their participation in achieving those objectives. For any given partnership, individual companies may wish to participate differently depending on their unique position and competitive advantages (or disadvantages)—in such scenarios, flexibility in addressing technical challenges would enable mutually-beneficial arrangements that would encourage participation by all types and sizes of companies. This issue encompasses various aspects of, among other things, finding common ground for research priorities, handling intellectual property in an efficient and sensible manner that will allow companies to recoup reasonable returns on their investments, and defining which aspects of the work can be readily-shared among participants. If these challenges can be addressed in a satisfactory framework, the chances of success for a public-private partnership rise considerably.

Question 2. Dr. Tracy, when Boeing was developing the 787 Dreamliner, a good portion of the wind tunnel testing was done at the European Transonic Windtunnel instead of at the National Transonic Windtunnel (NTW) at NASA Langley. You mentioned in your testimony that in years past, NASA possessed state-of-the-art aviation infrastructure for research and development (including some of the best wind tunnels in the world). However, NASA had not maintained these facilities and, consequently, Boeing had to go overseas to carry out much needed research. Since then, NASA Langley has invested nearly $10.5 Million to upgrade the NTW and make it more competitive. Given the existing infrastructure at NASA Langley, and the recent improvements and investments there, do you think that Boeing will utilize their facilities for future projects rather than using facilities overseas?

Answer. Boeing has been working with NASA on wind tunnel improvements by providing a suggested set of test quality requirements and productivity improvements needed by the industry. NASA has been actively addressing these requirements along with other industry requirements and is working hard to demonstrate many of these facility improvements in the National Transonic Facility (NTF) in mid-2013. Depending on the results of this demonstration, future Boeing Commercial Airplanes (BCA) test plans utilizing comparable facilities overseas could be modified to use the NASA Langley NTF.

Boeing also has provided inputs around requirements and improvements to other NASA facilities, but the NTF appears the nearest term opportunity for NASA and Boeing. Across Boeing, including BCA, Boeing Defense, Space & Security, and Engineering, Operations & Technology, test requirements are dependent on the type of vehicle being tested and the test objectives. The test objectives drive what wind tunnel test facility to utilize.

Question 2a. How much can we do with newer modeling and simulation technology (as opposed to large physical structures like wind tunnels)?

Answer. Today, aircraft design and assessments are heavily influenced by our ability to accurately and reliably predict the aircraft aerodynamic characteristics. These predictions are tied closely to wind tunnel test validation to minimize developmental risks. Computational Fluid Dynamics (CFD) codes (a modeling/simulation code) are very good at predicting aircraft aerodynamic properties around the typical cruise conditions. However, the accuracy and reliability of the predictions at ex-

treme conditions need substantial improvement. There are many opportunities to further improve these predictive capabilities. CFD is one area that NASA continues to play a key role in advancing the state of the art in aerodynamic modeling. Additional advancements in predicting aircraft characteristics over the entire flight envelope efficiently and quickly are required. This is an important area for NASA to continue research with industry and university partnerships. Research on turbulence modeling, transition models, grid adaptation, complex geometric capability, aeroelasticity, efficient time accurate and time averaged flow solvers are just a few examples of important areas for NASA research. Another research area for NASA is validating the fundamental CFD simulation models with detailed wind tunnel measured information obtained on basic flow features.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TOM UDALL TO DR. JOHN J. TRACY

Certifications

Question 1. I recently met with representatives from Aspen Avionics and Bendix/King, general aviation manufacturers located in New Mexico, and was concerned to learn that current certification processes are creating a competitive disadvantage for them compared to foreign manufacturers. Can you please explain further how the processes disadvantage U.S. manufacturers?

Answer. While at a macro level the Federal Aviation Administration (FAA) has already implemented many improvement initiatives for certification process efficiencies and others are in progress, there is clearly room for further improvements to ensure competitive advancements within our aviation and manufacturing industries. It is our belief, shared by industry, that the FAA has not fully integrated these initiatives, overseen their implementation, measured their benefits, or clearly linked them to a future state. This is the best opportunity for leverage, looking forward.

While civil Commercial Transport manufacturers share many similar certification requirements and processes with civil General Aviation manufacturers, there are differences in their direct lines of businesses stemming from the certification categorization, risk and complexity of their respective systems. The success of commercial aviation manufacturers in the United States is dependent on the performance of the FAA. If the FAA is not efficient and effective, or does not have efficient and effective processes, that can put U.S. manufacturers at a competitive disadvantage relative to manufacturers in other countries from a cost and schedule performance perspective.

To this point and in collaboration with our industry associations, Aerospace Industries Association (AIA) and General Aviation Manufactures Association (GAMA), U.S. industry has expressed concerns about the efficiency and effectiveness of the FAA. In response to those concerns, Congress included language in the FAA Modernization and Reform Act of 2012 (a.k.a. the Act or the Reauthorization Bill,) directing the FAA to conduct an immediate study of FAA certification processes and their ability to support anticipated U.S. manufacturer certification activity.

The FAA chartered an Aviation Rulemaking Committee (ARC) to specifically make recommendations to improve efficiency and reduce costs through streamlining and reengineering the certification process to ensure that the FAA can conduct certifications and approvals in a manner that supports and enables the developments of new products and technologies and global competitiveness of the U.S. aviation industry. The ARC has completed its assessment and 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. Given these conclusions, the ARC developed specific recommendations around these known areas of the inefficiencies and opportunities for further improvements. Those recommendations have been approved by the FAA and now submitted to Congress for their review and approval.

Question 1a. Do you have recommendations on how to improve the process to level the playing field?

Answer. Yes. The best opportunity for leveling the playing field and achieving efficiency gains in today's current state of the certification process is for the FAA to (1) develop comprehensive implementation plans of key improvement initiatives and develop a tracking and monitoring process to ensure effectiveness of them, and (2) maximize delegation with appropriate oversight to the greatest extent in current delegation systems.

In response the recent Congressional FAA Modernization and Reform Act of 2012 (a.k.a. the Act or the Reauthorization Bill,) the FAA along with industry participants formed an Aviation Rulemaking Committee (ARC) to conduct a study of FAA certification processes and their ability to support anticipated U.S. manufacturer certification activity. The ARC was chartered to develop specific recommendations which improve efficiency and reduce costs through streamlining and reengineering the certification process, such that the FAA can conduct certifications and approvals in a manner that supports and enables the developments of new products and technologies and global competitiveness of the U.S. aviation industry.

The ARC recently completed their study, concluding the best opportunity for efficiency gains in today's current state of the certification process is for the FAA to (1) develop comprehensive implementation plans on key improvement initiatives and develop a tracking and monitoring process to ensure effectiveness, and (2) maximize delegation with appropriate oversight to the greatest extent in current delegation systems. These two core reform recommendations along with four other sub recommendations were documented in a formal ARC report and submitted to the FAA in May 2012. The FAA completed a thorough review of the ARC's recommendations and in coordination with the Office of the Secretary (OST) and Office of Management and Budget (OMB), the FAA tells Congress that it has accepted the ARC's recommendations as of August 2012 and is currently implementing several of the recommendations and/or actions to fulfill the intent of the recommendations. The FAA plans to develop a comprehensive implementation plan by October 2012 and will begin full implementation the ARC's recommendations by February 2013.

The FAA's prime mandate is to ensure aviation safety and provide continuous improvement across the global aviation transportation system. The recommendations coming forward from the ARC and now submitted to Congress by the FAA are complementary to and fully supportive of this mandate and to that mandate, it is important to note the excellent safety record within the U.S. over the last decade within the aviation industry. Each day, nearly six million people fly safely, making flying the safest form of transportation. This didn't just happen. Rather, working together, the entire aviation industry achieved this through innovation, collaboration and delegation. Safety will always remain the fundamental imperative across aviation because it's the right thing to do—for people and for business. The global economy relies on a safe, efficient aviation system to create jobs and sustain economic performance. The aforementioned recommendations around process efficiency established by the ARC and accepted by the FAA are not in conflict with safety; instead, they are fully complementary. They enable enhanced safety by allowing FAA to focus their critical resources on items with safety leverage instead of those things which do not. It is a win—win: enhance safety via focused efforts, and increase efficiency/competitiveness for U.S. manufacturers.

So, as we go forward, this collaboration among manufacturers, regulators, airlines and industry will reach even higher to make the safest form of transportation even safer while driving further efficiency, effectiveness and leveling into the certification process playing field.

STEM

Question 2. The statistics for the need to replace the aging workforce are staggering and I am concerned to hear that despite efforts from the agencies and industry we are still falling behind. I am also concerned though by reports I have been hearing recently that the current job market isn't able to absorb the graduating students. Is there simply a timing issue or is there a deeper issue of matching the supply skills/training to the needs of the industry?

Answer. It's more than a timing issue as our country and the aerospace industry faces a competitive gap that we can close only if more of our young people pursue careers in STEM-related fields. Unless we can close this gap, it will have grave implications for our Nation's competitiveness, security, and defense industrial base.

High-tech jobs are becoming difficult jobs to fill not because there is a labor shortage but because there is a skills shortage. This is especially acute in the U.S. defense industry because many government programs can employ only U.S. citizens. Of the positions open in the aerospace and defense industry in 2009, two-thirds required U.S. citizenship. Yet less than 5 percent of U.S. bachelor's degrees are in engineering, compared with about 20 percent in Asia, for example. Our pipeline of qualified U.S. STEM workers is too small: Of nearly 4 million children who start pre-school in the United States each year, only about 25 percent of them go on to complete basic Algebra in junior high, only 9 percent declare a STEM major at the undergraduate level, only 4.5 percent actually graduate with a STEM-related degree, and only 1.7 percent graduate with an engineering degree—and not all engineering degrees are applicable to aerospace.

Question 2a. Also can you address how industry is tracking the need versus the supply and addressing pipeline issues if needed?

Answer. Boeing has 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, diverse talent that matches our innovation and growth strategies.

Boeing also regularly monitors aerospace industry-related research and studies, such as a Deloitte and Manufacturing Institute survey that showed 83 percent of manufacturers reported a moderate or severe shortage of skilled production workers to hire and 74 percent of manufacturers said a shortage of skilled production workers had a "significant negative impact" on either their productivity or expansion plans.

In 2011, Boeing invested about $25 million directed towards science, technology, engineering and math (STEM) education programs. Boeing encourages students to pursue technical careers and supports many innovative initiatives and interactive programs. For example, Boeing is working with colleges and universities to support student access to higher education through scholarships, enhanced curricula and boosting engineering graduation rates. Boeing also works with industry and education leaders to establish public-private partnerships to enhance STEM education. In Illinois, Boeing is a supporter of Illinois Pathways, a program that helps students pursue academic and career interests through STEM Learning Exchanges while attending high school. STEM Learning Exchanges are designed to increase student enrollment in STEM programs by forming networks between education institutions and employers that are focused on new and growing technical fields. STEM Learning Exchanges will also connect students with adult mentors and provide internship and other work-based learning opportunities.

Additionally, Boeing maintains partnerships with community and technical colleges to develop a pipeline of workers trained in cutting-edge aerospace manufacturing skills. With assistance from the Washington Aerospace Training and Research Center—a workforce training initiative funded by the aerospace industry and Washington State—and readySC—a subsidiary of the South Carolina Technical College System—Boeing created recruitment, pre-hire and workforce training programs in aircraft assembly and fabrication, maintenance and other skill areas critical to building aircraft. Students attending these courses can earn pre-hire certificates to prepare themselves for Boeing and other aerospace jobs.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. AMY KLOBUCHAR TO DAN ELWELL

Question 1. Minnesota has a thriving aviation industry. In fact, GAMA members, three of which have headquarters in Minnesota, support over 2,600 direct jobs in my state. Additionally, we have tens of thousands of general aviation, commercial and cargo pilots who reside in the state, as well as the 12th busiest airfield in the U.S. The Minneapolis-St. Paul Airport alone supports 17,000 jobs. All of these jobs and more are dependent on the competitiveness of the U.S. aviation industry from manufacturing to passenger and cargo services. How are you, or your members, working to ensure aviation related and supported jobs stay in the U.S.?

Answer. AIA has no higher priority than working to keep our aerospace manufacturing industries second to none in global competitiveness. Some of our key initiatives include: (1) working hard to educate Congress and the public on the devastating effects of sequestration (see attached report on the effects of sequestration on the civil aviation industry); (2) constant and consistent advocacy of Federal funding for timely implementation of the Next Generation Air Transportation System (NextGen); (3) advocating for an immediate restoration of the R&D tax credit, which helps keep aviation jobs in the United States; (4) supporting STEM initiatives, to help provide the skilled workforce needed for long-term competitiveness; (5) advocating adequate funding for FAA's certification workforce and the implementation of certification streamlining, which are critical for industry to move new products into the marketplace in a timely manner; (6) supporting efforts to integrate unmanned aerial systems (UAS) into the national airspace and advocating export control reform of policies impacting UAS; (7) collaborating with the International Trade Administration on the NextGen Vendors Group, which works to promote NextGen as the global standard and expand market opportunities for U.S. companies selling abroad; and (8) promoting adequate funding for the Export-Import Bank and export policies that support traditional aviation manufacturing as well as emerging technologies including UAS and NextGen.

Question 2. As we look to the future, it is clear that the U.S. should exercise strong leadership in finding, developing, and deploying sustainable, available, and affordable alternative fuels for the aviation industry. Alternative fuels can be domestically produced here in the U.S.—in fact isobutanol products for jet fuel are already being produced in my home state in Luverne, MN. The Future of Aviation Advisory Committee's 2010 report recommended U.S. leadership in alternative aviation fuels; however, it also said that the U.S. would need to have commercially viable alternative aviation fuels within 3–5 years to have global leadership in technology. Do you think that the industry is going to make that mark?

Answer. AIA agrees that the development of cost-competitive, sustainable alternative fuels is critical for the aviation industry over the long term. The aviation industry has committed to reducing global CO_2 emissions in half by the year 2050, and this cannot be achieved without the significant operational use of sustainable alternative jet fuels. Aviation manufacturers have been investing heavily in the Commercial Aviation Alternative Fuels Initiative (CAAFI), FAA's Continuous Low Emissions, Environment and Noise (CLEEN) program, and a number of international partnerships for at least the past five years. The lack of refinery capacity is now being addressed by a multi-agency Federal MOU committing three agencies to invest $170 million in the program, matched on at least a dollar-for-dollar basis by private industry. In addition, large-scale fuel purchases by the Department of Defense, their leadership in the RDT&E of alternative fuels, and financial support under the Defense Production Act are key components of the overall program. Partnerships such as those between Gevo and the Air Force, which prompted the alternative fuel production in Minnesota that you mentioned, are critical to the development and eventual stabilization in the price of these fuels.

To date these efforts have proven that various biofuels can deliver equal or better aircraft performance when compared to petroleum. However, "commercially viable" fuel indicates fuel that is cost-competitive with petroleum, and that is not yet the case. The fossil fuel industry has had a century to develop and refine its fuel sources, technologies, and distribution networks. As with other transformative technologies, to become price competitive the alternative fuels industry will need government and investment community support in its early stages. In a 2011 report, the Air Transport Action Group (ATAG) notes that there are several different alternative fuels that can be utilized, some of which are in an early stage of development. However, one important factor affecting each of these technologies is the need to increase production volume to bring the price down. As the report says, "The key to improving the economics of using biofuels for air transport will be to significantly reduce unit production costs." Unfortunately, proposed restrictions on alternative fuel purchases such as section 313 of S. 3254 (the National Defense Authorization Act, 2013) are a step backward in this regard and could cripple the emerging biofuels industry just as it is getting off the ground.

Although the United States is not likely to have commercially cost-competitive alternative fuels in the 2013–2015 timeframe, we are not yet falling behind other nations in our pursuit of these technologies. It is essential to maintain strong investment in this area to keep from backsliding. A real cost-benefit will occur when the price of biofuels is stabilized.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. MARK WARNER TO DAN ELWELL

Question. Dr. Tracy testified that accelerating the development of advanced composites for use in the commercial aviation sector could dramatically help the U.S. maintain its edge in aviation manufacturing, creating good jobs here in the U.S. as well as more efficient planes. Would you agree that a public-private partnership in the U.S. focused on this issue would hold potential? What public sector entities do you think should be involved in such an endeavor? How would you propose to tackle some of the key challenges that kind of partnership would face, such as how to structure a successful IP sharing agreement?

Answer. The development and use of advanced composites and alloys is a key area of innovation for the global aviation market, and currently U.S. companies maintain a world leadership position. However, the technology investments and research and development pendulum has swung away from the U.S. as foreign governments invest in the development and use of advanced composites. Without continued support from the private and public sectors, the U.S. may soon lose its leadership position in these technologies. AIA strongly supports Federal programs furthering the development of advanced aerospace composites, including the consideration of public-private partnerships. Clearly, the entities involved would need to reach agreement on

issues such as facility usage, staffing, and intellectual property, but these issues should not be insurmountable. We believe that, at a minimum, the NASA Langley Research Center and DOD research labs should be considered for any such partnership. NASA Langley has been actively involved in the research and development of composite materials and structures for almost four decades now, and their expertise is world renowned.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TOM UDALL TO DAN ELWELL

Question 1. UAS—New Mexico has been a leader in testing unmanned aerial systems (UAS) and is looking forward to the expansion in manufacturing of UAS. Can you explain further the impact UAS will have on the aviation industry and the role it will play in the global market?

Answer. AIA believes unmanned aerial systems (UAS) could have a revolutionary impact on the aviation industry over the next decade or two. They have the potential to bring down end user costs for various applications by being lighter weight, smaller, and by using state-of-the-art NextGen technology. In addition to unmanned aerial vehicles, technology used in UAS has the potential to improve safety across the board. In the future, general aviation and commercial aircraft may be controllable from the ground in emergency medical or critical security situations.

To date, the use of UAS in our national airspace has been largely limited to defense operations and testing, border security, and weather data collection. These limitations are largely due to cumbersome restrictions and limitations on flying in the U.S. national airspace system (NAS). However, in the FAA Modernization and Reform Act of 2012, Congress required the FAA to fully integrate UAS systems into the NAS not later than 2015. In addition, the National Defense Authorization Act for Fiscal Year 2012 mandated the FAA to establish up to six UAS test sites around the country within one year of enactment. These and similar provisions enacted over the past year will go a long way toward opening up a vibrant new sector of the aviation industry.

It is often said that UAS systems are attractive and cost-effective for jobs considered "dull, dirty, and dangerous". These systems can be used for wildfire surveillance and mapping; floodplain surveillance; search and rescue; disaster response; crop monitoring; law enforcement; and many other missions. However, growth in public and commercial markets will be limited by the FAA's ability to meet the requirements and schedules in the FAA Modernization Act and by the availability of increasingly-scarce RF spectrum for the command and control of UAS assets.

AIA believes the global UAS market will develop rapidly over the coming decade, and different regions of the world will have different uses and priorities. In Africa, for example, UAS systems would be important tools for wildlife monitoring, anti-poaching, and conservation efforts. In energy-rich regions, they would be valuable for pipeline monitoring. Although the specific uses and aircraft/sensor combinations will vary, U.S. manufacturers should be competitive in all areas of this worldwide industry: aircraft; sensors; datalinks and control systems; and integrated logistics support. We also believe that test sites, like the one in New Mexico, could foster a market in themselves, as overseas companies bring their ideas to U.S. shores for testing.

One factor undermining our competitiveness in this market involves the inclusion of UAS systems under the Missile Technology Control Regime (MTCR). The 25-year-old MTCR has the effect of placing severe restrictions—a strong presumption of denial—on the sale to international partners of Category 1 UAS (those capable of carrying a 500 kg payload to a range of 300 km). While the goal of the MTCR is noble—to "limit the risks of proliferation of weapons of mass destruction . . ."—it did not foresee the evolution and promise offered by current UAS technologies. UAS, unlike other items covered under the MTCR, would be ill-suited for WMD delivery. They are often slow moving, have limited maneuverability, are trackable on radar, and easy to intercept by air defense systems. Even so, the U.S. continues to apply the "presumption of denial" as an actual denial, absent compliance with case by case conditions that are not communicated to industry in a predictable, efficient, or transparent fashion.

Furthermore, applying MTCR guidelines to the export of UAS systems does not stem the proliferation of unmanned vehicles. Parallels can be drawn between the UAS market and the U.S. commercial satellite market. In 1999 Congress passed a law that moved commercial satellites from the more flexible export policies of the Commerce Department to the more restrictive export policies of the State Department. Since the 1999 law, we have seen U.S. commercial satellite manufacturers

consistently lose ground to their international competitors who do not face restrictive export policies on their products. The lack of export opportunities for UAS manufacturers has not yet noticeably stunted U.S. competitiveness in the global market, but the time is coming. The U.S. application of the "presumption of denial" has the potential to incentivize other countries to find alternative solutions from other countries that have a lower threshold to overcome than "the strong presumption of denial," or to develop their own technology and compete against the U.S. In addition, the MTCR constraints needlessly restrict the supply of critical capabilities (such as intelligence, surveillance and reconnaissance) that are in high demand by the U.S. military and our coalition partners.

AIA believes the MTCR and U.S. application of its requirements should be updated to reflect the evolving role of UAS. Specifically, the U.S. should: (1) Develop and establish performance criteria and survivability criteria, such as radio frequency/infrared signature, speed and maneuverability, and absence of weapons delivery systems, with other MTCR signatories, which would allow Category I UAS not suitable for WMD delivery to be evaluated for export without a presumption of denial; (2) Develop a better process to communicate conditions for export to industry and negotiate security arrangements for UAS with specific importing countries before exercising the presumption of denial for export; (3) Clarify that lighter-than-air vehicles are not subject to MTCR jurisdiction; (4) Review how UAS are covered under the International Traffic in Arms Regulations (ITAR) and make changes to U.S. Munitions List (USML) Category VIII as appropriate.

Quesiton 2. STEM—The statistics for the need to replace the aging workforce are staggering and I am concerned to hear that despite efforts from the agencies and industry we are still falling behind. I am also concerned though by reports I have been hearing recently that the current job market isn't able to absorb the graduating students.

- Is there simply a timing issue or is there a deeper issue of matching the supply skills/training to the needs of the industry?
- Also, can you address how industry is tracking the need versus the supply and addressing pipeline issues if needed?

Answer. The workforce issues faced by the aerospace and defense industry are complex and multifaceted. They start with the need to replace the entire baby boomer generation of workers who will be retiring over the next several years. This daunting challenge is complicated by the changing nature of the industry, which on the defense side is decreasingly focused on the manufacture of large aerospace structures and increasingly involved in new and growing business areas, such as cybersecurity and biotechnology. Therefore, while our companies have good jobs open for which they cannot find talent, there are also recent engineering graduates who cannot find jobs. Today our companies employ and need all kinds of engineers, especially systems engineers and software engineers, but not necessarily every aerospace engineer who applies can be hired.

Our companies are also facing a serious shortage of or mismatch with the skills needed for many of our "touch labor" positions. Both major corporations and smaller supplier companies are having difficulties finding people ready to work in these kinds of jobs. In some cases, companies have developed in-house training programs to bring new hires up to the required skill level. Others are partnering with local community colleges and training firms to develop customized Career Technical Education (CTE) curricula to grow the technical workforce in regions where it is needed.

Demographic shifts in the country mean we must draw more women and traditionally underrepresented ethnic groups into engineering and skilled touch labor positions in order to fill jobs today and into the future. And efforts to attract, recruit and retain a qualified and vibrant workforce are made more difficult by program terminations and scale-backs due to funding cuts in DOD, FAA and NASA budgets driven by Federal budget pressures.

These multiple factors and divergent pressures present the need to understand and comprehensively address the complex interaction of Federal funding for production programs and research and technology; the impact of such funding decisions on the industrial base; and their long-term implications for the industry's ability to develop and sustain a robust and diverse aerospace and defense workforce.

Leaders in the aerospace and defense industry several years ago recognized these workforce challenges and began to address them, both for the future of the industry and for the economic well-being and security of the Nation. Our member companies work on these difficult issues through an AIA Workforce Steering Committee and a subordinate Workforce Committee. We have partnered with the trade journal *Aviation Week and Space Technology* and other groups to conduct an annual, official

workforce survey of the aerospace and defense industry. This study is refined and improved each year, to provide greater fidelity of the data and a more complete understanding of trends in our industry and its workforce requirements.

At the urging of our industry leaders, AIA also took the lead in spearheading the formation of the Business and Industry STEM Education Coalition (BISEC), a coalition of associations representing employers of science, technology, engineering and mathematics (STEM) professionals. Since 2010, BISEC members have pledged to work with other private sector stakeholders and federal, state and local officials in all fifty states to grow the pipeline of both STEM professionals and a STEM-literate general workforce.

The long-standing and deep-seated problems in our education and workforce preparation system will not be turned around overnight. Some progress is beginning to show, as the business, education, and workforce development sectors engage in more meaningful and sustained conversation about their mutual and respective needs, interests and roles in preparing students for 21st century jobs. Our industry has contributed a systems dynamics model of the STEM education system, and the tool is being utilized to identify key intervention points that offer the greatest prospect of increasing the number of STEM graduates. We have made a good start and are working hard, but much remains to be done and changed to ensure that American youth develop the academic knowledge, technical skills, and personal capacities—including creativity, teamwork and innovation—to keep the U.S. aerospace and defense workforce at the forefront of the global industry.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. AMY KLOBUCHAR TO DR. STANLEY SORSCHER

Question 1. Minnesota has a thriving aviation industry. In fact, GAMA members, three of which have headquarters in Minnesota, support over 2,600 direct jobs in my state. Additionally, we have tens of thousands of general aviation, commercial and cargo pilots who reside in the state, as well as the 12th busiest airfield in the U.S. The Minneapolis-St. Paul Airport alone supports 17,000 jobs. All of these jobs and more are dependent on the competitiveness of the U.S. aviation industry from manufacturing to passenger and cargo services. How are you, or your members, working to ensure aviation related and supported jobs stay in the U.S.?

Answer. As workers, we invest our careers in our industry. We understand how the success of our employers is tied to prosperity in our local communities.

SPEEA members and staff serve on our local, regional and state economic development boards, the state export promotion center, and advisory boards for education and training programs. SPEEA and the Machinists union joined business and government leaders in recruiting employers to our aerospace cluster. We advocate for R&D, investment in our industry, strong educational systems, and lifelong learning to retain experienced mid-career employees.

In aerospace, a strong design and manufacturing problem-solving culture is part of our competitive advantage. We make the business case that our members demonstrate the value of a capable and effective workforce, particularly in aerospace, where products are complex, heavily engineered, and have high standards for performance and safety.

One of our top legislative priorities is the rebuilding our domestic manufacturing base. We coordinate with our employers to advocate for the Export Import Bank, building the new Air Force tanker in America.

Wherever we can, we work with local, state, and national policy-makers. Our consistent message is that the purpose of public policy should be to raise living standards and the quality of life in our communities. Of course, that includes making business succeed.

Question 2. From the stories my colleagues and I have heard as travel throughout our states talking about how to matchup our education system with the realities of the job market, it is clear a skills gap exists. In your testimony you mention the need to explore the feasibility of connecting educational records to employment records. Can you expand on how you see the aviation industry utilizing information like that? Is this something you see being done at a state or Federal level?

Answer. Policy-makers hear conflicting impressions of the STEM labor market. Employers report difficulty filling jobs requiring "high-demand" skills. On the other hand, STEM graduates report difficulty finding employment in their field of study. Unemployment for STEM occupations spiked in 2009 and remains well above long-term levels.

The answer to Senator Udall's question provides an alternative interpretation of the apparent skills shortage: Employers are hiring fewer workers, and employers are being more selective.

In that case, raising enrollments and increasing graduations will not address the apparent skill shortage. If we do a better job of managing our existing investment in education, we could meet employers' demands, and place graduates in good jobs.

Tracking recent graduates would give policy-makers a valuable policy management tool.

Question 3. What is the unemployment rate for recent graduates? Do graduates find work in their field of study? How many are still employed after 1 year and 5 years? To what extent are students migrating regionally and nationally?

Answer. Rather than relying on anecdotes, and impressions, we could use employment patterns for recent graduates to see where we are being effective and where educational resources are not matching the labor market. We can then adjust our social investment in education using reliable and timely data.

This would help employers, legislators, students, families, and communities make informed decisions about education and careers.

States and educational programs already track some of their graduates. A particularly good example is Washington State's online report of worker training outcomes (*http://www.wtb.wa.gov/WorkforceTrainingResults.asp*) from data gathered across all sectors. This evaluation was originally authorized in 1991.

At the national level, the National Center for Science and Engineering Statistics, within the National Science Foundation, surveys recent STEM graduates. Surveys are conducted on a two-year periodic schedule.

Surveys are expensive. Collecting and analyzing the data are time consuming.

Instead, universities and training programs can provide simple reports identifying graduates and programs of study. State employment agencies can match student information to employment records when graduates appear in the workforce.

Records supplied by schools would show graduates' educational background, and the corresponding records from employers would give NAICS codes and occupation data.

The 2009 Federal stimulus program provided funding to study a longitudinal data system in Washington State, which could serve as a model for collecting data on graduates and tracking their transition to employment.

By coordinating these records regionally or nationally, we could strengthen our understanding of dynamics in the labor. We would build on existing labor market data systems to provide high quality data at relatively low cost. Training and retraining programs for mid-career workers would work the same way.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. MARK WARNER TO DR. STANLEY SORSCHER

Question. Dr. Tracy testified that accelerating the development of advanced composites for use in the commercial aviation sector could dramatically help the U.S. maintain its edge in aviation manufacturing, creating good jobs here in the U.S. as well as more efficient planes. Would you agree that a public-private partnership in the U.S. focused on this issue would hold potential? What public sector entities do you think should be involved in such an endeavor? How would you propose to tackle some of the key challenges that kind of partnership would face, such as how to structure a successful IP sharing agreement?

Answer. U.S. manufacturers have very good design and manufacturing practices for composite materials.

We should recognize that other countries aggressively pursue technology that we've developed. Our public and private investment in domestic innovation is under constant pressure from offset agreements and well-designed industrial policies in China, India, Korea, Japan, Russia and other countries.

Publicly funded R&D is justified on theoretical and practical grounds, particularly in aerospace, where formidable foreign producers are beneficiaries of their governments' well-designed industrial strategies.

A public-private partnership is basically a two-way promise—a private gain, in exchange for a public good. In this case, the public good is the expectation that innovative new products and processes will be commercialized in America.

Global economic integration blurs the identity of national economies. Any public-private partnership should have specific provisions that sharpen the domestic identity of our innovation strategy. This is not protectionism. It is the fundamental quid pro quo of all national manufacturing strategies used by every country in the world.

Two mechanisms can encourage business to produce new products domestically. One is a condition for domestic content. That could come in the form of a minimum domestic content requirement, or a clawback that increases as domestic content falls. A domestic content provision may not make sense for every invention or innovation, but it might be applied at a higher level, such as a condition to participate in the partnership. In principle, foreign producers could meet domestic content provisions and benefit from a public-private partnership.

Another mechanism is preferential licensing for domestic commercialization. IP sharing is often managed through licensing agreements. Licensing can be on favorable terms for domestic commercialization, but at less favorable terms when the IP is commercialized offshore.

My written testimony recommended updating the Bayh-Dole Act, which grants broad authority to universities and other agents who commercialize publicly funded research. That approach made more sense before globalization integrated our economy with other economies around the world. In the 21st century global economy, preferential licensing for domestic commercialization helps restore the fundamental quid pro quo of public-private partnerships.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TOM UDALL TO DR. STANLEY SORSCHER

Question 1. STEM—The statistics for the need to replace the aging workforce are staggering and I am concerned to hear that despite efforts from the agencies and industry we are still falling behind. I am also concerned though by reports I have been hearing recently that the current job market isn't able to absorb the graduating students. Is there simply a timing issue or is there a deeper issue of matching the supply skills/training to the needs of the industry?

Answer. Aerospace must deal with an aging workforce. Employers have a few years to replace a generation of experienced workers and transfer knowledge from older workers to younger ones. It takes 3 to 5 years for a recently graduated engineer to become fully productive. A similar learning curve applies to hourly and technical non-exempt workers.

In the older integrated business model, employers invested in more training, mentoring and career development for new workers, to move them along the learning curve. Employers managed their internal labor market, by transferring employees from one program to another.

Lately, many employers prefer to let the labor market deliver exactly the right skills as needed. In this market-oriented human resource model, training costs are externalized to the employees, and to publicly funded training and retraining programs. The employment relationship is much weaker and contractors often outnumber direct employees.

In 1996, Intel's chief operating officer, Craig Barrett, told his stockholders, "The half-life of an engineer . . . is only a few years."

In the July 6, 2012 *Wall Street Journal,* 3G Studios CEO James Kosta shared a similar sentiment. "Engineers were outliving their usefulness from one project to another. When projects end, it's better to re-evaluate your entire staff and almost just hire anew." (*http://tinyurl.com/c7n6xjm*)

This labor market model actually performs well in the motion picture industry, where cast and crew, directors, writers and editors are chosen for their specific talents for each project. When the project concludes, workers are released back into the labor market. This employment model makes less sense in aerospace, IT or other high-tech occupations.

Peter Cappelli, director of Wharton's Center for Human Resources described this shift in human resource management in the Wall Street Journal on October 24, 2011. Employers have become very selective, writing narrow job descriptions that eliminate many capable qualified applicants who could do the job with a small amount of retraining. (*http://tinyurl.com/3nz676g*)

I am reminded of one employer, desperate for an experienced 2.2 GHz antenna engineer, when all he could find were applicants with experience at 1.9 GHz.

In basic labor market terms, unemployment remains high relative to pre-recession levels. Wages, adjusted for inflation, are stagnant since 1999 for engineering, computing and science occupations. Real wages have fallen slightly in the last few years for computing and science occupations.

Data in figures 1 and 2 show overall unemployment rates for high-skilled occupations. Unemployment rates for recent graduates will run higher than the overall rate. Similarly, when mid-career workers in computing and IT lose a job, their re-employment prospects are relatively bleak.

Lindsay Lowell, at Georgetown University, and Hal Salzman at the Urban Institute report more than three times as many S&E four-year college graduates as S&E job openings, so increasing graduations may not be a productive use of scarce educational resources.

If employers are hiring fewer workers, they can be very specific about their requirements, which may look to them like a shortage of "high-demand" skills. Many graduating will find very poor job prospects, and drop out of STEM careers, seeking employment in other fields.

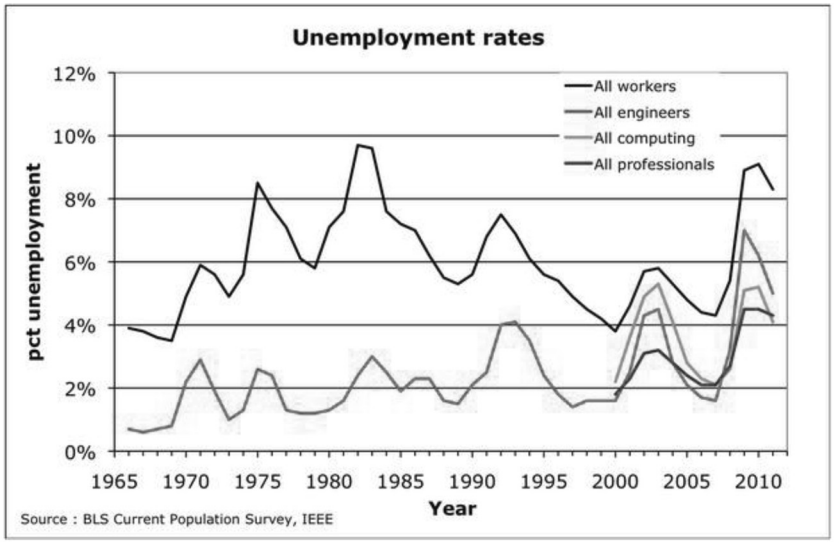

Figure 1. Long-term trends in unemployment for engineering, computing, and professional occupations, compared to all workers.

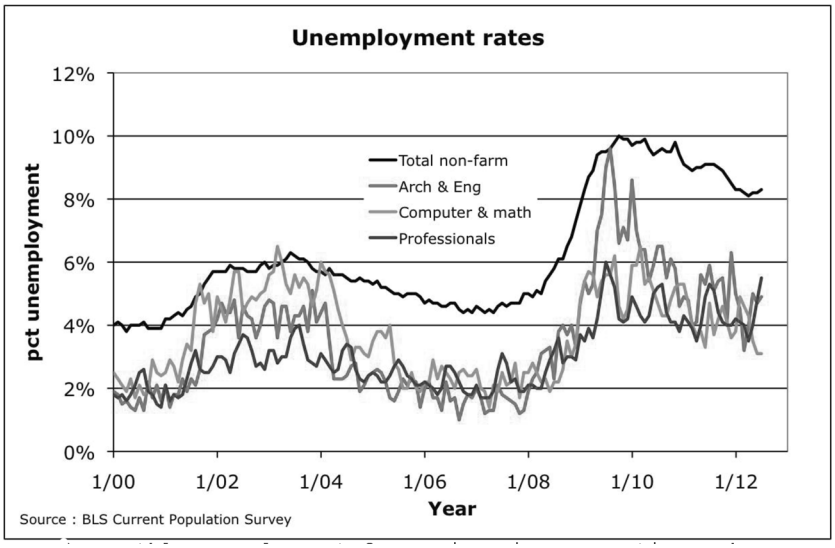

Figure 2. Monthly unemployment for engineering, computing and professional occupations is still at or above levels seen shortly after the tech bubble.

Question 2. Also can you address how industry is tracking the need versus the supply and addressing pipeline issues if needed?

Answer. Industry typically tracks the length of time a job stays open; the number of applications per opening; the acceptance rate on offers (how many offers must they make to fill an opening); need to increase salaries offered; demand for signing bonuses, relocation packages or other incentives; attrition of employees after 1 year and 5 years; and availability of workers locally versus nationally.

Employers can address pipeline issues by expanding their geographic range for recruiting, building long-term relationships with key universities, internship programs, and by relying on contractors or temporary workers. They can also build in employment practices that retain current experienced workers.

This comes back to the connection between the business model and the employment relationship. Some business models value experience, long-term employment, and career development. That puts the employer in control of workforce management. If the employer's business model treats workers more like a market commodity, then the market will set terms for supply.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO PETE BUNCE

Question 1. Apprenticeship Programs for the Manufacturing Workforce—Mr. Bunce, do business jet manufacturers utilize apprenticeships as one means of developing a pipeline for its manufacturing workforce? What do you see as the challenges to a successful apprenticeship programs at business jet OEMs and their suppliers?

Answer. GAMA Member Companies utilize numerous avenues to develop, attract, and maintain their workforce. While there are a variety of initiatives to expose children and young adults of all ages to aircraft to develop an interest in aviation, as well as attract women and veterans to our workforce, a key point of entry is apprenticeship programs.

An exemplary example is Gulfstream Aerospace Corporation. The company utilizes a formal trainee, co-op and intern program, and maintains one formal apprenticeship program entitled the 'Youth Apprenticeship Program' that targets high school students and has been extremely beneficial tool for recruitment and exposure. This avenue provides local students with access to both soft and hard skill training, including hands-on experience to many diverse career paths at Gulfstream. The program hires high school juniors and seniors who can work up to 2,000 hours as a way to transition students into their post-secondary career whether it be a direct hire, technical certificate or college training.

Challenges to implementing such a program at a business entity include management of the day to day program. In addition, the business must be open to training students and giving students real work experience that aligns with the career path students are studying. Gulfstream works hard to let students interview for a position that they are interested in and continue to learn and grow with new experiences and opportunities throughout the apprenticeship. Finally, managers and supervisors must be aware of the program and interested in bringing on a student for an extended period of time. The youth apprentice program lasts two years, so students are able to be trained and provide valued work to the team.

Question 2. NextGen—Mr. Bunce, do you believe the FAA is paying enough attention to the implications of NextGen to business aviation?

Answer. General aviation is part of the discussions when it comes to developing NextGen requirements including the development of key communication, navigation and surveillance technologies. There are many developments, such as Enhanced Vision Systems, where general aviation manufacturers are leading the way ahead for airlines due to the need for utility and safety in business aircraft operations. The one area where our members have some concerns is the proliferation of FAA operational approvals for a number of NextGen operations. Basically, the operational approval process is a paperwork bureaucracy through which each aircraft is subject to hundreds of pages of paperwork to conduct a mostly normal operation. If the FAA doesn't make the operational approval process more efficient, the agency will sink under a NextGen mountain of paperwork before any of these technologies, and their intended benefit, are derived.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. AMY KLOBUCHAR TO PETE BUNCE

Question. Minnesota has a thriving aviation industry. In fact, GAMA members, three of which have headquarters in Minnesota, support over 2,600 direct jobs in my state. Additionally, we have tens of thousands of general aviation, commercial and cargo pilots who reside in the state, as well as the 12th busiest airfield in the U.S. The Minneapolis-St. Paul Airport alone supports 17,000 jobs. All of these jobs and more are dependent on the competitiveness of the U.S. aviation industry from manufacturing to passenger and cargo services. How are you, or your members, working to ensure aviation related and supported jobs stay in the U.S.?

Answer. One of GAMA's top priorities remains our initiatives to reduce impediments manufacturers face in getting products to the global marketplace. We firmly believe that our efforts to reform and improve the Federal Aviation Administration's (FAA) certification processes will ensure that the U.S. remains a viable and attractive place for general aviation manufacturers. In working to reduce the negative impact delays in FAA certification activities have upon manufacturers, we will ensure that U.S. policies and procedures remain competitive with the policies and procedures of foreign authorities.

Additionally, GAMA has advocated that the Transportation Security Administration and Department of Homeland Security complete action on the Foreign Repair Station Security Rulemaking. As a result of TSA failing to comply with this mandate, the FAA has been prohibited from issuing new foreign repair station certifications since 2008. Unfortunately, the ban on new foreign repair station certificates is having a detrimental impact on U.S.-based aerospace companies looking to tap into rapidly expanding overseas markets. The longer the prohibition is in effect, the more damage it will cause our Nation's competitiveness in aviation and exports. Further, it is expected that foreign nations will impose a reciprocal ban that prevents repair stations located in the United States from gaining approval from foreign civil aviation authorities if we do not act quickly.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. MARK WARNER TO PETE BUNCE

Question. Dr. Tracy testified that accelerating the development of advanced composites for use in the commercial aviation sector could dramatically help the U.S. maintain its edge in aviation manufacturing, creating good jobs here in the U.S. as well as more efficient planes. Would you agree that a public-private partnership in the U.S. focused on this issue would hold potential? What public sector entities do you think should be involved in such an endeavor? How would you propose to tackle some of the key challenges that kind of partnership would face, such as how to structure a successful IP sharing agreement?

Answer. GAMA believes that any endeavor that provides public and private entities the ability to work in a collaborative fashion is beneficial and holds potential.

We believe there are a number of stakeholders that are vital to this concept, including colleges and universities and research consortiums with expertise in the aviation field, the government, and manufacturers.

Finally, there are obvious challenges that need to be addressed to ensure success. Typically, we find that to achieve a constructive outcome, it is important that objectives and parameters be clearly defined and understood by all stakeholders in advance of collaboration.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TOM UDALL TO PETE BUNCE

Certifications

Question 1. I recently met with representatives from Aspen Avionics and Bendix/King, general aviation manufacturers located in New Mexico, and was concerned to learn that current certification processes are creating a competitive disadvantage for them compared to foreign manufacturers. Can you please explain further how the processes disadvantage U.S. manufacturers?

Answer. To remain competitive, GAMA companies constantly design and develop new products. All these products require Federal Aviation Administration (FAA) approval. Under current resources and processes, FAA cannot support industry activity and has implemented a "sequencing" program to delay certification projects until resources are available. These delays result in increased costs, missed business opportunities, and affects economic and job growth. The recently enacted FAA Reau-

thorization legislation requires FAA to review the certification process and implement actions to improve the efficiency and effectiveness of the certification process. These provisions will enhance safety and reduce unnecessary regulatory burden. Congress has a key role to play in supporting the agency in making these changes. Moving forward, we hope these improvements, combined with adequate funding levels, will eliminate delays and keep pace with industry's certification demands.

Question 2. Do you have recommendations on how to improve the process to level the playing field?

Answer. We believe that policymakers need to hold FAA accountable and ensure progress is made on efforts to improve the efficiency of effectiveness of the certification process. In doing so, GAMA believes this will level the playing field and sustain U.S. based manufacturers in a global marketplace.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO NICHOLAS E. CALIO

Question 1. NextGen—Mr. Calio, in your testimony you speak to all the important benefits NextGen will bring to the airlines once implemented. One of the unanswered questions is who is going to pay to put NextGen on passenger and cargo aircraft.

- What is A4A's current thinking on NextGen equipment?
- The FAA bill included a section authorizing public-private partnerships for NextGen equipage. Do you believe the FAA has all the authority it requires to conduct a public-private partnership for NextGen equipage? From a practical standpoint, how viable do you think it is to use public-private partnerships as a mechanism for NextGen equipage?

Answer. A4A members believe that the Administration should be guided by a National Airline Policy that addresses the tax, regulatory and infrastructure environment and would enable America's airlines to contribute at an even greater level to the economy. An indispensable element of such a policy is the modernization of the U.S. air traffic management system, or NextGen.

Carriers believe that tangible, near-term improvements in schedule reliability, customer satisfaction, and emissions reductions can be achieved. Today's NextGen technologies and current equipage can deliver greater efficiencies than currently realized. In order to achieve these near-term benefits, we encourage the FAA to focus on ensuring that the needed policies, procedures and training are in effect to enable realization of the benefits.

Our priorities for that modernization are to:

- accelerate the development and approval process of performance-based navigation (PBN) procedures that utilize existing equipage; and
- streamline the National Environmental Policy Act (NEPA) review process to expedite the development and implementation of PBN and other environmentally beneficial NextGen procedures, relying on authority granted in the FAA Modernization and Reform Act to use categorical exclusions.

Accordingly, while we share the goal of advancing NextGen, we believe the most effective way to accomplish this goal is for the FAA to develop, certify and implement procedures and policies that allow carriers to maximize their current Area Navigation (RNAV) and Required Navigation Performance (RNP) capabilities. FAA's delivery of reduced fuel burn and other tangible, operational benefits from these foundational capabilities will provide the most powerful incentive for carriers to equip. Once these near-term benefits are realized, the FAA could explore financial incentives to facilitate equipage, including the use of public-private partnerships.

Question 2. Challenge to the industry in hedging fuel costs—Mr. Calio, your industry's fuel bill was over $50 billion last year, a 28 percent increase from 2010. Fuel is the airlines largest operating expense. Fuel prices are also volatile, making it difficult to plan and hedge. After spiking at nearly $115 in May, crude prices are back below $90. This volatile roller-coaster ride continues to pose enormous challenges to the airline industry.

Earlier this year, it was reported that Delta Airlines had basically thrown up its hands with trying to hedge fuel costs and decided to just buy a refinery and refine its own jet fuel. Delta said it would spend $150 million to acquire a refinery in Pennsylvania, and another $100 million to refurbish the plant to increase its output of jet fuel.

Delta estimated that it would reduce its annual fuel expense by $300 million once the refinery is refurbished and operating again. To achieve similar fuel savings, Delta would have to buy 60 new-generation, fuel efficient, narrow-body planes like the Boeing 737, a capital investment that would total $2.5 billion.

How would you rank fuel prices, and the ability to hedge fuel price risk, compared to other major challenges the airline industry has faced in the last decade? What about going forward?

Answer. At 34 percent of operating expenses in the first half of 2012, fuel continues to be the industry's largest and most volatile cost. In fact, A4A analysis of data from the Department of Transportation shows that the cost of fuel rose 262 percent from 2000 to early 2012. Moreover, according to the U.S. Energy Information Administration, after reaching a record high in 2011, the spot price of jet fuel is poised to break that record in 2012. As a result, many A4A carriers have and continue to use fuel-hedging as an expensive form of insurance. Some carriers, like Delta, are exploring fuel savings via direct investments in the fuel supply chain. All carriers continue to seek every viable means of increasing fuel efficiency, as decreased consumption is the best possible form of hedging.

Unfortunately, there is no silver bullet to mitigating jet fuel price volatility. One of the five core components of our National Airline Policy is to mitigate commercial jet fuel price volatility. In order to achieve this important goal, Congress and the Administration should take the following policy actions:

- Ensure that the Commodity Futures Trading Commission (CFTC) follows its statutory mandate to curb excessive speculation and manipulation in the oil futures market;
- Ensure that the FAA expedites the most cost-beneficial elements of NextGen, including cost-effective, widespread deployment of performance-based navigation (PBN) procedures;
- Promote increased domestic fuel production;
- Continue and expand research and development into alternative aviation fuels; and
- Repeal the 4.3-cent-per-gallon commercial jet fuel tax, which costs the airline industry about $400 million annually.

Question 3. How financialization of commodities affect end-users such as airlines—Mr. Calio, as you know, around the year 2000 institutional investors discovered commodity index funds as a new investment opportunity and have flocked en masse to commodity futures markets. Earlier this year we had experts testify in the Energy and Natural Resources Committee who presented data showing how trading volumes and trading volume volatility of crude oil futures have clearly and substantially grown since January 2001.

I don't think it is a coincidence that before 2001 it was unheard of for crude oil prices to jump a few dollars a day unless the U.S. was under a trade embargo or about to go to war. Yet today, without a major event in sight, we witness price swings that would put the wartime spikes of yesteryear to shame. Do you think commodity index funds have this much influence on commodity prices? Should they?

Answer. We are indeed concerned that commodity index funds, sovereign wealth funds and other similar investment vehicles amplify the price movement of crude oil prices. Whether described as market psychology or feedback, price swings of a commodity induce price swings in the related index fund, and this in turn can cause a larger price movement of the underling commodity. It is well known that market movements often are driven by the psychology and emotion of investors as much as by empirical data.

Question 4. How treating commodities as an asset class affects producers and consumers—Mr. Calio, the Commodity Exchange Act clearly states that commodity futures markets were created for two basic purposes: (1) to provide a venue for producers and consumers of physical commodities to hedge their risk; and (2) to establish a fair price based on supply and demand fundamentals.

- How does the ability for retail and institutional investors to invest in commodity markets through commodity index funds—making commodities an asset class like securities—impact the ability of fuel consumptive industries, like airlines, hedge risk?
- Do you think that the current level of speculative volume and investment is harming commercial hedgers like airlines?

Answer. Volatility in the commodity markets, which we believe is influenced by index funds and other similar investment vehicles, makes hedging more difficult

and expensive. Because greater volatility creates more risk, fewer counterparties are willing to engage in hedging transactions, terms and conditions are more restrictive, and hedging costs are greater. The volume of speculative activity is a significant problem. Historically, speculation accounted for 30–40 percent of crude oil market activity, while true hedging accounted for 60–70 percent. This balance enabled sufficient liquidity for the market to function effectively and efficiently perform its dual roles of price discovery and facilitating true hedging. However, in recent years speculative activity as swamped true hedging and it is estimated that speculative activity now accounts for 60–70 percent of market activity, while hedging has fallen to 30–40 percent. At the same time, the crude oil market has become much more volatile. As noted, increased volatility has impaired the ability of our members to execute hedging their strategies, or to engage in hedging at all.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. AMY KLOBUCHAR TO NICHOLAS E. CALIO

Question. Minnesota has a thriving aviation industry. In fact, GAMA members, three of which have headquarters in Minnesota, support over 2,600 direct jobs in my state. Additionally, we have tens of thousands of general aviation, commercial and cargo pilots who reside in the state, as well as the 12th busiest airfield in the U.S. The Minneapolis-St. Paul Airport alone supports 17,000 jobs. All of these jobs and more are dependent on the competitiveness of the U.S. aviation industry from manufacturing to passenger and cargo services. How are you, or your members, working to ensure aviation related and supported jobs stay in the U.S.?

Answer. The U.S. airline industry is a major source of high-quality, middle class U.S. jobs, with the average airline salary exceeding the national average. The best way to ensure U.S. airline job growth is create an environment that allows the airline industry to become sustainably profitable. Title 49 of the U.S. Code explicitly directs the Department of Transportation "to encourage efficient and well-managed air carriers to earn adequate profits and attract capital, considering any material differences between interstate air transportation and foreign air transportation." Since 2000, the industry has lost over $50 billion and shed over 150,000 jobs—nearly one-third of its total workforce. When the industry is profitable, even nominally, it creates and sustains U.S. job and purchases new aircraft and equipment, spurring job growth at Boeing, GE, UTC (Pratt & Whitney, Goodrich), Rolls Royce, Harris, Honeywell, Rockwell Collins and numerous and other U.S. aerospace manufacturers, not to mention thousands of others throughout the supply chain. In fact, U.S. government analysis has found that every 100 airline jobs support 360 non-airline jobs. With their recent return to albeit modest profitability, U.S. passenger airlines have added jobs for 19 months in a row, according to the Bureau of Transportation Statistics, amounting to nearly 11,600 new employees in the industry. Implementation of a National Airline Policy that rationalizes our tax and regulatory burdens, enhances our global competitiveness, modernizes our infrastructure, and mitigates jet fuel price volatility will help the industry generate healthier profit margins in the long-term, thereby driving more significant U.S. airline job growth.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. MARK WARNER TO NICHOLAS E. CALIO

Question. Dr. Tracy testified that accelerating the development of advanced composites for use in the commercial aviation sector could dramatically help the U.S. maintain its edge in aviation manufacturing, creating good jobs here in the U.S. as well as more efficient planes. Would you agree that a public-private partnership in the U.S. focused on this issue would hold potential? What public sector entities do you think should be involved in such an endeavor? How would you propose to tackle some of the key challenges that kind of partnership would face, such as how to structure a successful IP sharing agreement?

Answer. NASA, the FAA and the U.S. aviation industry are already partnering on a wide range of research and development projects, including in the area of composites. For example, NASA is implementing the Environmentally Responsible Aviation (ERA) program, a public-private partnership for research and development of aircraft propulsion, vehicle systems and airframe technology, which aims for breakthroughs that can be implemented in the medium-to-long term. Focusing on the short-to-medium term, the FAA and industry stakeholders are participating in the FAA Continuous Lower Energy, Emissions and Noise Technology (CLEEN) program, a unique form of public-private partnership where the FAA funds a portion (up to 50 percent) of the research to mature technologies that show promise to bring

significant aviation environmental improvements, while allowing industry to retain appropriate rights to their proprietary technology. In addition, the FAA is working with industry to expedite deployment of advanced NextGen procedures, including performance-based navigation (PBN) procedures that will reduce aircraft track miles, fuel consumption and carbon dioxide (CO_2) emissions.

The aviation industry's goals of carbon neutral growth from 2020 and achieving a 50 percent reduction in the total CO_2 footprint of aviation by 2050 require such public-private partnerships. Historically, most of the reductions in the environmental impact of aviation have been due to improvements in the technology on the aircraft, including the use of advanced composites on new types design aircraft such as the 787. While significant improvement opportunities are still possible, the timelines for the development of new technologies tend to be very long, with additional time involved for the introduction of these technologies into the aircraft fleet. In order to realize benefits within a foreseeable timeframe, the aviation industry needs to achieve successful maturation and deployment of new technologies within the next 3–8 years. While public-private partnerships—such as the CLEEN initiative—can help accelerate the development of technologies and their introduction into the aircraft fleet, we are concerned that efforts to cut the budgets of FAA and NASA for fundamental aeronautics research and development could threaten these important programs.

Aviation-related R&D investments are vital for a high technology economy and are the enablers of solutions that can decrease emissions, create good jobs, increase U.S. competitiveness, and provide substantial enhancements to mobility to the benefit of the public. The U.S. aerospace industry is a top exporter, so increased capability in this sector also benefits the U.S. balance of payments and is essential to achieving the Administration's stated goals of doubling exports over the next five years. Leveraging the aviation industry's R&D investment is critical to maximize benefits in the shortest period.

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