REMARKS FOR ADMINISTRATOR BOLDEN

AIAA AVIATION 2013

"Embracing a World of Change: NASA's Aeronautics Research Strategy"

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Thank you for inviting me (Sandy Magnus). I think the video we just viewed provides a quick look at the issues behind a new strategic vision that's driving the many exciting things NASA is doing today in aeronautics.

We like to say "NASA is with you when you fly." I don't know about you, but I fly a lot – around the world. It's not always pleasant. But I'm glad that the innovations NASA has helped drive are there to make it better and safer. I'm grateful that we have so many opportunities to do things today that we couldn't when I first took my seat behind the controls in a cockpit or even years later when I piloted a space shuttle to orbit.

Here on Earth, civil and general aviation accounts for $1.3 trillion of U.S. economic activity annually. Air travelers spend around $636 billion in the U.S. economy and more than 10.2 million direct and indirect jobs are generated by aviation. And whether or not you flew today, something you needed did – about $1.5 trillion in freight is shipped every year by air.

Those are some big numbers. They mean a lot to the economic and cultural health of our country and that's why we do what we do.

But, beyond whether or not I got my upgrade yesterday or my plane was on time, today in aeronautics we've looked at the big picture, how aviation fits into a global picture of incredible economic and population expansion in certain parts of the world, and technological innovation everywhere.

What we see has led us to an exciting new strategic vision for NASA aeronautics and that's what I want to talk to you about today.

Today, NASA’s aeronautics research agenda is focused on substantially reducing fuel consumption, emissions and noise -- to make the Next Generation Air Transportation System, or NextGen, a reality. Looking ahead, we also are tackling emerging challenges likely to change the face of aviation during the next twenty to forty years.

One of our key research goals is safe, efficient growth in global operations, and we've been working on air traffic management tools to reduce delays, with the secondary benefit of helping reduce aviation's impact on the environment.

The phrase "Timing is everything," means something very specific to pilots and astronauts. Precision is everything. The complexity of air traffic control reminds me of the shuttle countdown, which required complicated procedures and teamwork to get off the ground at just the right time to reach our slot in the sky -- which is even more difficult if you are trying to rendezvous with the International Space Station. We don't launch all around the clock because we like random launch times! I've heard that the Gemini astronauts described rendezvous and docking timing as one guy on a merry go round tossing a ball to another guy on another merry go round. So timing is everything.

So it's very timely that today I am able to announce the latest example of NASA and the FAA working together to enhance safety and efficiency in the nation's airspace. NASA has just handed off to the FAA a new, NextGen software tool that will improve the flow of aircraft from runways to cruising altitudes.

Just last week, the tool developed by NASA, called Precision Departure Release Capability (PDRC) was transferred to the FAA for further development and implementation. This marks the third time in the past two years our two agencies have collaborated on the development of new technologies to enable aircraft to fly more efficiently, easing congestion in the nation's skies and reducing aviation's impact on the environment.

PDRC was developed after an extensive analysis of aircraft operations showed that an uncertainty in precise departure times due to factors such as bad weather and heavy traffic may result in missed opportunities for those flights to efficiently merge into the flow of high altitude traffic. PDRC accurately predicts both departure times and departure runways. This information is automatically sent to en route centers, where PDRC provides ascent trajectories from takeoff to the merge point in the high altitude traffic stream.

PDRC can help us to fill up to 80 percent of the slots in the high altitude flow that would otherwise go empty due to timing issues. It can complement the technologies and procedures already being used by the FAA to manage traffic flow and ease delays through each phase of flight.

One of my colleagues has a great way to explain just what PDRC can do. He talks about how, when he heads out of Washington, he tries to get on interstate 395 to get to 495 so that he gets to 66 West to hit the HOV lanes and, ideally, "get behind a tractor-trailer and in front of an '86 Mazda" (think of those vehicles as the equivalent of aircraft in the overhead flow of traffic). That's the plan anyway.

He said, with PDRC, he would know exactly when he has to back out of the driveway in order to get from 395 to 495 to 66 West and be in the HOV lanes to end up behind that tractor-trailer and in front of the '86 Mazda. (My apologies if you drive an '86 Mazda, but you get the idea).

We're proud of this work, and it's part of a larger integrated strategy of strategic goals and research that will advance our work to make this planet healthier, and to improve lives. Those are really the underpinnings of everything we do at NASA, and in aeronautics, the person on the street really has the chance to see it impact their daily lives.

The world is changing fast. We all know it. If you've been around a few decades like me, you've seen new technologies snapped up and adopted so quickly that within a generation, young people can't even contemplate what it was like, for instance, not to have a mobile phone or access to the Internet, let alone color TV.

Let's face it; even watching programs on an actual television is not really their thing. It's hard to remember a time when taking a flight across the country was a big deal, rarely done, and we hadn't yet walked on the moon.

But we don't want our legacy to be legacy systems. We want to be at the bold, anticipatory edge. We know a lot about trends in population growth in other areas of the world. We are quite aware of emerging nations grabbing hold of technologies and making them their own. In this global environment, the U.S. not only needs to innovate to lead, we need to innovate to drive change that helps our economy stay aligned with our values regarding the environment.

For U.S. aviation companies to compete and to sell, they must look beyond our shores and focus on nothing less than transforming air transportation -- transforming mobility -- to maintain current levels of business while striving to lead and innovate in meaningful ways.

The new NASA Aeronautics strategic vision is designed to meet the near-term challenges of a global air transportation system. We want, in the long term, to make that system truly sustainable and ultimately, to transform aviation.

We built our foundation on understanding emerging global trends, identifying the mega-drivers for aviation that result from those trends, and focusing research on areas that respond to those drivers.

We looked, for instance, at how traditional measures of global demand for mobility, such as economic development and urbanization, are growing rapidly.

We looked at how severe energy and climate issues create enormous challenges for affordability and sustainability.

We took into account how revolutions in automation, information and communications technologies bring new opportunities for safe and autonomous systems.

This is the big picture framework on which we've built our aeronautics strategy. We're now aligning our program activities and investments toward progress in six research and technology thrusts:

- Safe, efficient growth in global operations, including NextGen and technologies to improve safety;

- Innovation in commercial supersonic aircraft, including work on lowering sonic boom impacts;
- Ultra-efficient commercial transports, including pioneering technologies for big leaps in efficiency and lessening environmental impacts;
- Transition to low-carbon propulsion and alternative fuels;
- Real-time, system-wide safety assurance, with emphasis on new integrated monitoring technology; and
- Breakthroughs in autonomy with high-impact applications.

I can't go into great detail in this forum on every one of these, but the associate administrator of NASA's Aeronautics Mission Directorate, Jaiwon Shin and his staff have been living and breathing this stuff for a long time. Jai and many of his folks are here today, and I hope you've had an opportunity to hear from and talk with them over the course of this conference.

But let me take, for instance, climate change, an issue that cuts across disciplines and boundaries and affects us all, and talk about our work there.

Sustainability is one of the key principles here. We've been working on environmentally friendly aircraft technologies and advanced future designs that dramatically reduce fuel use, noise, and emissions.

I think all of us feel the imperative to protect our planet. I know my perspective changed when I flew to space and saw the beauty and fragility of the Earth and the lack of boundaries except those made by nature.

But going green has to be more than a catch phrase. We're talking about reducing environmental impact enough that the increased air traffic we know is coming will be sustainable.

We must take care of our planet, and in the process figure out how to use less fuel -- and more alternative fuels -- and generate less emissions and noise.

As many of you know, after six years, NASA and its partners concluded flight tests of the X-48 blended wing body test aircraft. The team accomplished the goal of establishing a ground-to-flight database, and proved the low speed controllability of the concept throughout the flight envelope. Basically, this tail-less craft with top-mounted engines performed typical flight maneuvers at takeoff, cruise and landing speeds. The aircraft shows promise for meeting all of NASA's environmental goals for future aircraft designs, such as 70% reduction in emissions during cruise, 50% reduction in fuel use, and reduction in community noise by at least half.

Low-carbon propulsion and alternative fuels are going to be crucial as well.

Our ACCESS ground and flight test demonstrations are helping airlines, the FAA and other government agencies understand how alternative aviation fuels affect jet engine operation, and what burning these fuels does to the environment. Early data from the flight tests indicate that the alternate fuel blend has no significant effect on gaseous emissions, but it reduces black carbon emissions by more than 30 percent both on the ground and at altitude cruise conditions.

But none of that will matter if our planes aren't safe. Our real-time, system-wide safety assurance work includes data mining, predictive tools, and ongoing work toward a future potential instantaneous safety system for aviation.

NASA has taken data searches to a whole new level. We create unique computational tools that comb through trillions of pieces of aircraft data to identify issues before they become incidents.

In 2008, Southwest Airlines began using NASA data mining tools to automatically analyze flight recorder output from 7,200 flights, uncovering opportunities for operational improvements. Southwest has incorporated data mining software into daily operations, and has since used other NASA-derived techniques and programs to improve navigation procedures, fuel efficiency and track-mile savings.

NASA data mining tools are also being added to vehicle health management software used in some business jets and commercial aircraft. They alert ground maintenance personnel at the first sign of abnormal performance in engines and other aircraft components, making it possible to take corrective action long before warning lights are triggered and reducing maintenance delays at the departure gate.

As with PDRC, we continue to transfer other technologies to the FAA for wider application, such as Efficient Descent Advisor, which was transferred last year. That technology has the potential to reduce local noise and emissions pollution, reduce flight time and save $300 million per year in wasted jet fuel.

We've also made recent breakthroughs in supersonics. I've created a few sonic booms myself, and I know if we're going to realistically have the high-speed aircraft that create them flying over land, we're going to have to lessen their "degree-of-annoyance" to the people on the ground.

Then there's looking to how technologies that are revolutionizing other industries might do the same if applied to aviation – like smart materials, additive manufacturing (3D printing), information technology, embedded micro- or nano-sensors. NASA already works in some of these areas but the leaps-and-bounds advances in other parts of the economy could move us along even faster.

Like what we could add to our work by knowing more about the autonomous technologies in the self-driving Google car. Or hybrid-electric options for propulsion.

It's really something of a Renaissance time when you look at all the things we're working on and all the potential for breakthroughs that are right in front of us today.

I know NASA will continue to be at the forefront of these breakthroughs. But we must use our limited resources wisely to have the most impact possible. That's what this new aeronautics vision is all about.

We don't have to choose between safety and energy efficiency – between the environment and innovation. What we can choose is transformation over more of the same, as our work in many areas converges and supports overlapping areas.

The proof is already on every airplane today. I can't describe each and every technology from which every air traveler benefits, but they include the continuing evolution of stronger and lighter composites; winglets to improve efficiency; chevron nozzles to reduce noise; improved air traffic management technologies and much more.

People may have a vision of the future that has astronauts setting foot on new worlds, and that's certainly in our playbook. But the way we travel and get around our home planet is as much a visionary leap into tomorrow as anything.

We may not be looking at flying cars like the Jetsons, but I believe people will be even more amazed at how their air travel system is going to change and evolve to serve their needs while also supporting our global goals for cleaner energy and good jobs.

Aeronautics is part of NASA's name, but we don't know everything. We're counting on you to help us ask the right questions and help aviation meet the needs of the future. We need your feedback and your comments -- your participation.

Government can often do the big picture things that no single industry player can, but we also have to remain sensitive to our limited budgets and focus on the areas of most critical need and highest chances for success and impact. Your interaction with us is essential. None of us is, as they say, flying solo here. As we work on those big picture goals, we'll be striving to deliver high payoff technologies in the near term as well.

All of you here today are creating the world of tomorrow, as fascinating, as groundbreaking and innovative as anything we do in space, and I thank you for your dedication, commitment and innovation as we all embrace the future of flight. Now, I'm happy to take your questions. Thank you.