

**Remarks as delivered by The Honorable Shana Dale
NASA Deputy Administrator
Miami Future Forum
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Thank you all very much. It is an honor to be here at the University of Miami, where there are more than 15,400 undergraduate and graduate students continuing their learning in higher education.

I would like to thank Sergio Gonzalez and the University of Miami for being such wonderful hosts. I also would like to express NASA's appreciation to our sponsors and key partners.

This year, we're celebrating NASA's 50th anniversary. And it is fitting that we're holding one of only seven Future Forums in the State of Florida – the place where America's space exploration dreams have taken flight for over forty years.

During the last five decades, we've made amazing achievements in space. We've seen complete hurricanes for the first time, we've stepped on the surface of the Moon, and we've seen to the far reaches of the universe. We've discovered evidence of dark matter and dark energy, and with that, realized that we have seen only a tiny fraction of what is actually out there.

Yet, there is another side of NASA – a critical part of our story, which does not often receive the accolades or attention given to our exciting missions and discoveries.

SPACE ECONOMY

This other side of NASA contributes to what we call the "Space Economy" – the very tangible and pervasive ways in which the exploration of space affects our daily lives here on Earth. The Space Economy is the full range of activities that create and provide value to human beings in the course of exploring, understanding and utilizing space.

Space is pervasive in our lives, invisible yet critical to so many aspects of our daily activities and well-being. In fact, the Space Economy impacts just about every aspect of how we live, work and play – from weather and climate monitoring to space-based security applications that keep us safe.

When we use our GPS units to keep us from getting lost, draw cash from an ATM, or listen to satellite radio, we experience the benefits of the Space Economy. Today's Future Forum is about how NASA and the Space Economy contribute to your community.

Space exploration has created new markets and new technologies that have spurred our economy and changed our lives in many ways. According to a 2008 U.S. Space Foundation report, the Space Economy generated more than \$251 billion in total revenues worldwide, up 11 percent from the previous year.

So what does this have to do with NASA? Our mission is not to create commercial products or to stimulate the economy, although our work has often had those effects. Our focus is not on health care or medical research for the general public, yet we have made significant contributions in those areas. We are not the Nation's environmental agency, yet we provide critical information that advances environmental understanding. The simple answer is that exploration of space demands that we push the limits of knowledge, technology and precision in ways that we could not have originally imagined – and the benefits go far beyond our space exploration mission.

NASA contributes to the Space Economy through the three principal topics we will discuss today: *Inspiration, Innovation and Discovery*.

INSPIRATION

Let's face it. It all begins with education and because space exploration is so exciting and so cool, it inspires kids to go into science, engineering and math. Generations of students have been inspired to pursue these studies for a glimpse into the mysteries of our universe.

Over the last fifty years, many of these students have gone on to power every form of innovation from advancing the development of the computer chip to mapping the human genome. Maintaining our Nation's leadership role in the global economy requires that we encourage more American students to focus on these fields.

Using the inspirational pursuit of space exploration to spark the imagination of our youth is critical for keeping this Nation competitive and creating a scientifically literate populace.

I look forward to a solid discussion today on how best to inspire the next generation of innovators and scientists.

INNOVATION

Inspiration leads directly to innovation. NASA *drives innovation* by tackling hard, complex problems and overcoming seemingly insurmountable obstacles.

Because our mission demands putting humans, robots and rovers into harsh, extreme, and unforgiving environments, we must push the very limits of technology. This is often where we realize the greatest innovations.

Here is an example we can all relate to – where NASA's work to meet the demands of space exploration is leading to great innovations here on earth. When astronauts travel into space, their blood flow is affected. Here on Earth, the downward push of gravity causes our blood to settle in the lower areas of the body.

In space, the blood is pulled to the upper body. This is fine for the astronauts as they float around in space as long as they continue to exercise their lower body. The problem we have to address is that when the astronauts return to Earth, they may experience orthostatic intolerance, a rapid increase in heart rate that causes dizziness, nausea, fatigue, and heart palpitations.

For most of us, as we stand up, our bodies stabilize to the upright position. For those with orthostatic intolerance, there is an excessive increase in heart rate upon

standing, resulting in the cardiovascular system working harder to maintain blood pressure and blood flow to the brain. If you have ever stood up quickly and felt dizzy, you have had a glimpse of what some of our astronauts experience upon return to Earth. For them, it lasts for a few days and for some 500,000 Americans – it is chronic.

NASA research to resolve this issue has led to a number of promising results. One is the non-invasive medical device called ResQPOD that is now available for astronauts returning from space. It quickly and effectively increases the circulation of blood flow to the brain, helping reacquaint the astronauts with the feeling of gravity. This device is also available to the public to enhance circulation for half a million patients suffering from chronic orthostatic intolerance and for those who suffer from cardiac arrest and are not breathing.

In fact, according to the American Heart Association, every day about 900 Americans have sudden heart attacks and approximately 95 percent die before they reach the hospital. CPR can mean the difference between life and death because it increases blood flow to the heart and brain until the heart can be restarted.

ResQPOD is used in conjunction with CPR. And emergency medical technicians here in Miami and around the country are using the device to save lives. The ResQPOD was just inducted into the Space Technology Hall of Fame on April 10, 2008.

This is a technology that we refer to as a “spin-off” – a specific technology the agency has developed for its missions that the private sector then picks up and refines or transforms for commercial use.

ResQPOD is not a highly visible achievement of America’s space program but it is critically important. It represents only one of over 1,600 documented NASA-derived technologies that fuel local economies and strengthen U.S. economic competitiveness.

NASA’s aeronautics research programs contribute to numerous innovations, including winglets. Winglets are vertical extensions of wingtips that improve an

aircraft's fuel efficiency, cruising range, as well as the space required at the airport. They're being used around the world on all types of aircraft. A more recent NASA/industry research collaboration has resulted in a new engine nozzle design, which reduces engine noise.

NASA-derived technologies are also improving the conditions of people in the developing world. Water recycling and filtration systems engineered to sustain astronauts living on the International Space Station have been adapted to provide safe, affordable drinking water in poor or remote regions of the world where clean water can mean the difference between life and death.

These are only a few examples of what NASA technologies mean for all of us here on Earth, but it is by no means an exhaustive list. The point is that technology advancement doesn't recognize boundaries. The same capabilities that apply "out there" in space also apply directly to our most critical needs back here on Earth. Those advances are then refined, adapted or transformed to meet the challenges we face from ResQPOD to winglets to compact water filtration systems.

These advances also directly benefit Miami, and the state of Florida. NASA expenditures into the Florida economy in 2007 totaled \$1.78 billion and resulted in an economic impact of \$4 billion.

And NASA's investments driving these innovations are happening on a budget with a funding level that is six-tenths of one percent of the federal budget.

With this budget we are:

1. Embarking on the human journey back to the Moon for a mission that is vastly different from Apollo. About twelve years from now we'll live on the surface of that world, and learn enough to take the next steps;
2. Observing our Earth from the unique vantage point of space, which is essential for climate change research and disaster response and mitigation;

3. Conducting fundamental research in aeronautics that will lead to quieter, safer, and more efficient airplanes;
4. Expanding our knowledge about the universe and our place in it, through projects like the Hubble Space Telescope; and
5. Leading the largest international cooperative endeavor in the history of science and technology –the International Space Station;

Through these efforts, NASA is helping our high tech industries – a major force in U.S. economic growth – stay on the cutting edge of competitiveness.

DISCOVERY

From innovation, NASA opens the door to new discoveries. NASA’s pursuit of *discovery* pushes the extremes of science to answer fundamental questions, to achieve a greater understanding of the universe, and to determine what is happening to the Earth’s climate and why.

NASA discoveries provide real benefits for people around the world. On a recent trip to Central America, I was able to see first-hand the practical applications of NASA’s Earth science research and development, which enables improved environmental decision-making.

For example, NASA is helping the countries of Central America and the Dominican Republic with SERVIR which is Spanish, meaning “to serve.” SERVIR is a high-tech visualization and decision support system that integrates satellite imagery, forecasts models, and collects field data to address environmental changes and respond to natural disasters such as floods and wildfires.

Located in Panama, SERVIR is providing new capabilities to the countries of Central America while simultaneously strengthening the scientific research base of the region through training and capacity building programs. To date, NASA with support from USAID has trained literally hundreds of scientists and researchers throughout the region.

Rather than just simply providing data to the countries, a key objective is to build long term capacity and strengthen the capability of local experts. NASA is now working with USAID, NOAA, and other agencies to provide capabilities like SERVIR to other regions of the world, such as Africa.

The SERVIR program is leveraging NASA's Earth observation data capability to make a positive real-world impact on the quality of the environment and the quality of people's lives.

In Guatemala, NASA's satellite remote sensing data have been used to locate and interpret the remains of the ancient Maya civilization and climate science has offered insight into that civilization's rise and fall.

The remote archaeological site of San Bartolo with the oldest intact murals ever found in the Maya world dating back to 100 B.C., were discovered by Dr. Bill Saturno, Boston University Professor of Archeology. After finding San Bartolo, Saturno began working with NASA's archaeologist Dr. Tom Sever and Dr. Daniel Irwin, who is the SERVIR Project Manager. Bill noticed in some of the imagery acquired from NASA that the tree cover over known Maya sites tended to have a slightly different color in the satellite data than the surrounding vegetation.

Tom Sever inspected the data and found a similar color change in the tree canopies above other known sites. Working together, Sever, Saturno and Irwin confirmed that Maya sites could be identified from space with satellite imagery because the vegetation had a different color signature due to the decay of lime and lime plasters which were used in the construction of temples, plazas, roadways, and houses.

Sever has done extensive field work in the region and through his research using NASA satellite data, a large number of Maya sites have been identified beneath a rain forest canopy in the Petén area of Guatemala, which is considered the Maya civilization's heartland.

Through this important work, we are making incredible discoveries on Earth. These discoveries are helping us to learn more about our past and will help us to make better decisions in the future.

CONCLUSION

Inspiration, innovation and discovery: each is interdependent and through a circle of renewal, they combine to create a formula for future growth, prosperity and an improved quality of life. This symbiotic relationship forms the essence of the Space Economy and it is through inspiration, innovation, and discovery that NASA makes its most fundamental contributions to life here on Earth.

Space exploration is about imagining the future. It's about taking new steps, exploring beyond our limitations, creating something bigger and better than ourselves. Along the way, there are countless benefits, invaluable discoveries and technologies borne through the trials of exploration that enhance our lives on Earth. That's been true for NASA's first fifty years. And I have no doubt that it will be true in the next five decades.

Quests of discovery are as old as humanity itself. We go to see what is beyond the horizon, to test ourselves against the unknown, to face our fears and overcome challenges using all of our ingenuity and determination.

That's the spirit of exploration. And that's why the space program shows us at our best: dreaming, daring, and achieving. I look forward to a day of discussion about the future. A future brightened by the prospect of a growing Space Economy and continued space exploration, and all the promise that holds for the people of Miami, for our nation and for our world.

Thank you.