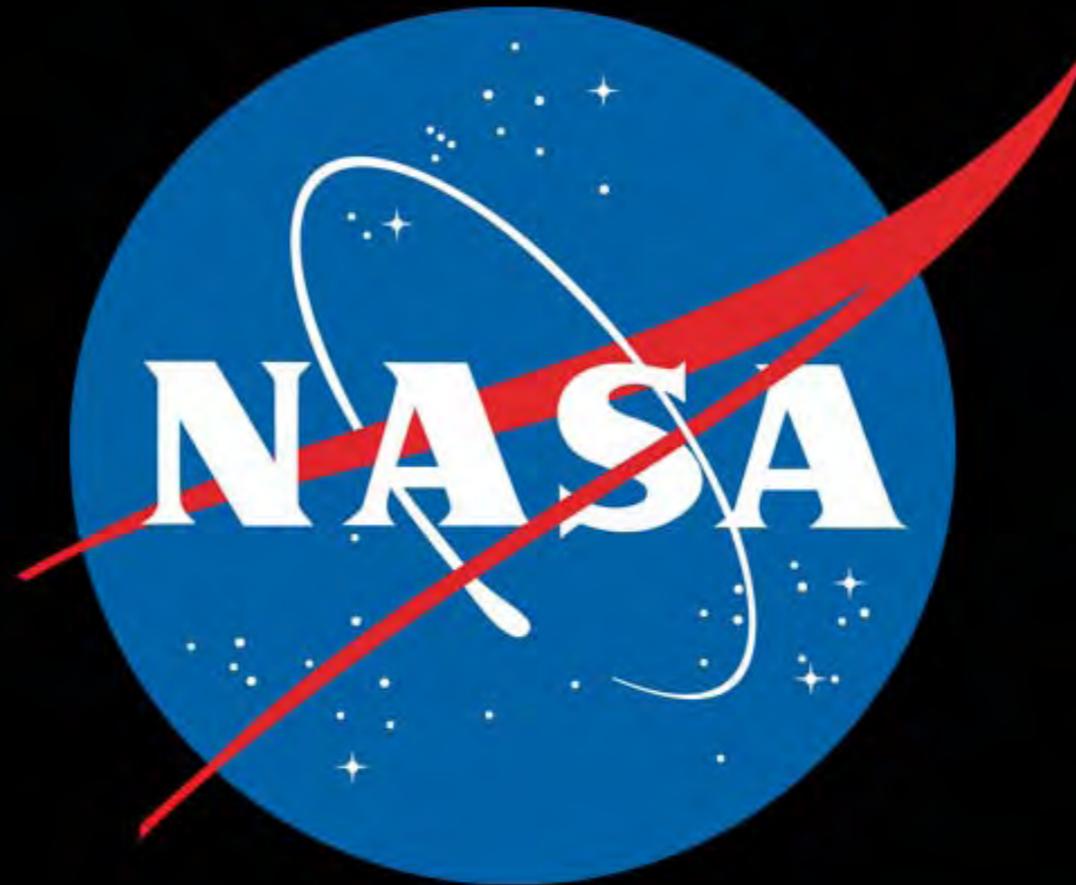


The Socio-Economic Benefits of Space Technology Applications and Spinoffs



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United Nations/Turkey/European Space Agency Workshop on
“Space Technology Applications for Socio-Economic Benefits”

Istanbul, Turkey
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Socio-Economic Benefits from Space

- **NASA seeks to enable socio-economic benefits from space activities.**
- **NASA's direction to do this traces to the Space Act that created NASA in 1958:**
"The Congress hereby declares that it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind."
- **The Act goes on to say that NASA should:**
"Provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."

Applications of NASA-Derived Technology

- **Health and Medicine**
- **Transportation**
- **Public Safety**
- **Consumer, Home & Recreation**
- **Environmental and Agricultural Resources**
- **Computer Technology**
- **Industrial Productivity**



Public Benefits of NASA-Derived Technology

- **Economic Growth**
 - New Jobs
 - New Markets
 - Increased Efficiency
 - Improved Competitiveness
- **Quality of Life**
 - Improved Safety
 - New Products
 - Lives Saved or Extended
 - Green Technologies
 - Environmental Cleanup

How Does Space Stimulate Economic Growth?

- **Activity directly related to space products and services.**

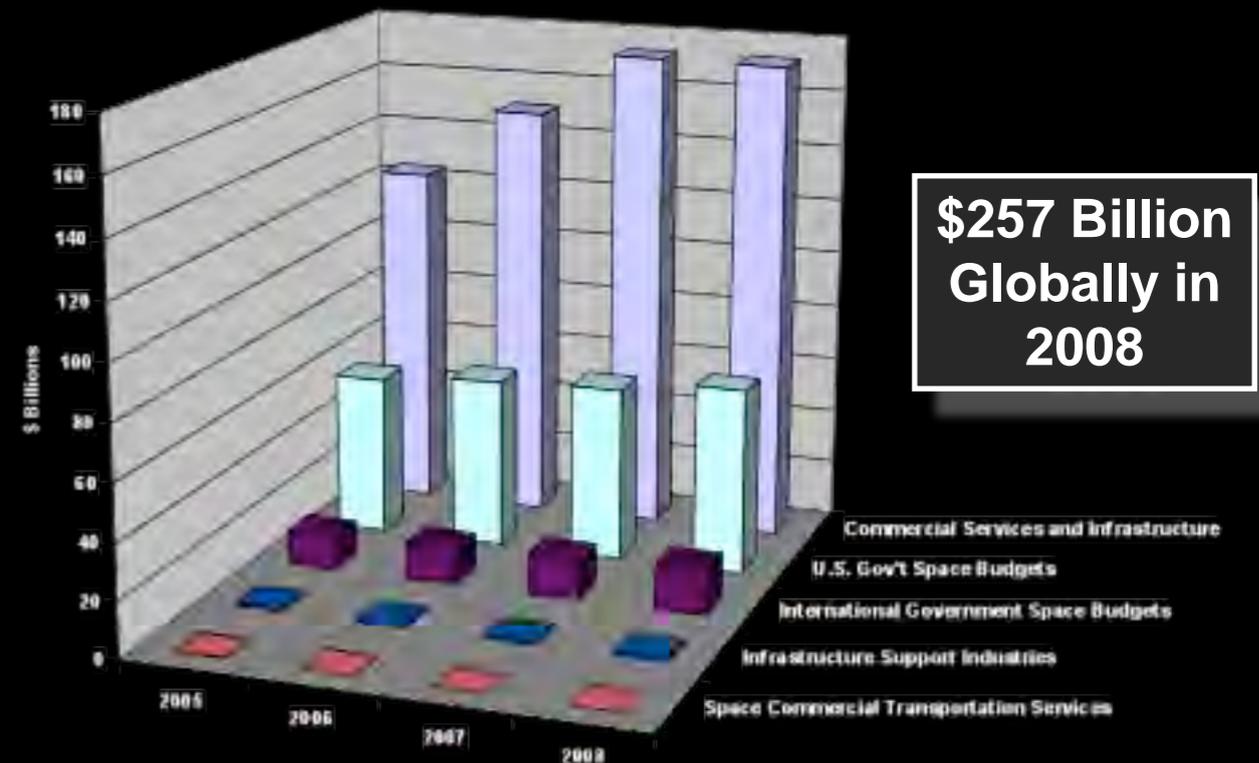
- Satellites, launch vehicles, ground systems.
- \$257 billion in 2008.

- **New capabilities, businesses, products and services derived from space technologies.**

- Spinoffs from the space program.
- More than 1,700 documented from NASA alone.

- **Productivity enhancements and quality of life improvements from the above, such as:**

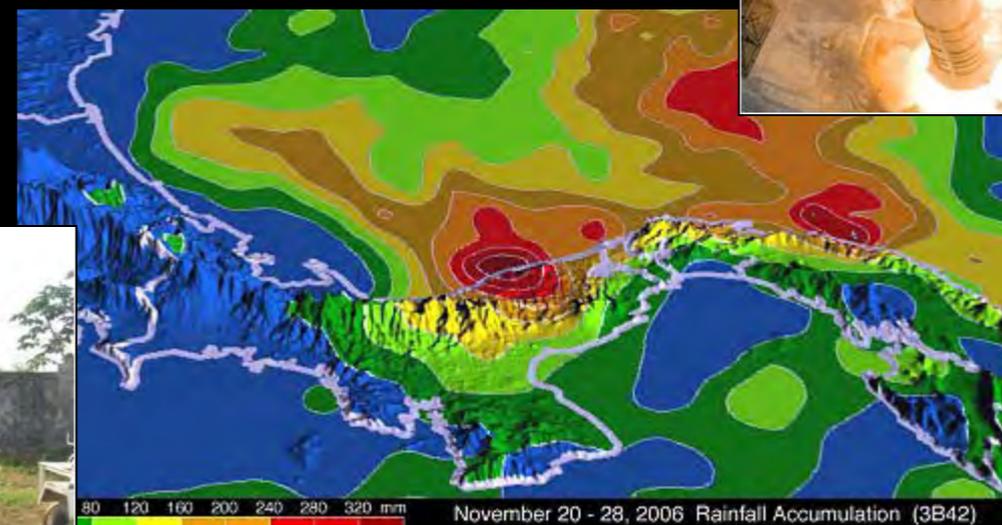
- Efficient tracking and positioning using GPS.
- Improved health from telemedicine, enriched baby food and other medical advancing spinoffs.



From the Space Report 2009, Space Foundation

NASA Technology: For the Benefit of all Mankind

- NASA technologies are being used across the planet and for the benefit of the developing world in important areas:
 - Clean Drinking Water
 - Improved Agriculture and Food Distribution
 - Telemedicine and Wireless Networks
 - Environmental Monitoring and Management
 - Disaster Warning and Relief
 - Educational Resources
 - Energy Storage
 - Hazard Reduction





Clean Drinking Water



- The Microbial Check Valve (MCV) was developed to ensure safe water for space explorers and has been used on all Space Shuttle missions.
- Lack of clean water is a problem for over 1 billion people on Earth.
- This MCV technology developed for space is now deployed in rural areas and developing countries around the world.



**KampangSalak,
Malaysia**



Kendala, Iraq



Chiapas, Mexico

Improved Agriculture and Food Distribution



- NASA conducts research on plant growth and food safety for space missions.
- Increased crop yield, disease resistance, and food preservation are key challenges facing farmers in developing nations.
- NASA research yielded growth chambers and ethylene reduction systems.



AiroCide helps farmers avoid rotted crops by extending the time to market in India and elsewhere.



Minitubers resist disease and increase crop yield throughout the world.

Energy Storage

- **NASA needs advanced energy storage method for long term space flights.**
 - Working with a former NASA scientist, Deeya Energy began developing iron-chromium hybrid flow battery technologies in 2004.
- **Deeya is now installing systems in rural areas in the developing world to provide for improved communications and significant emissions reductions.**
 - Plans include “power-station-in-a-box” products for village electrification, combining solar and wind generation sources.

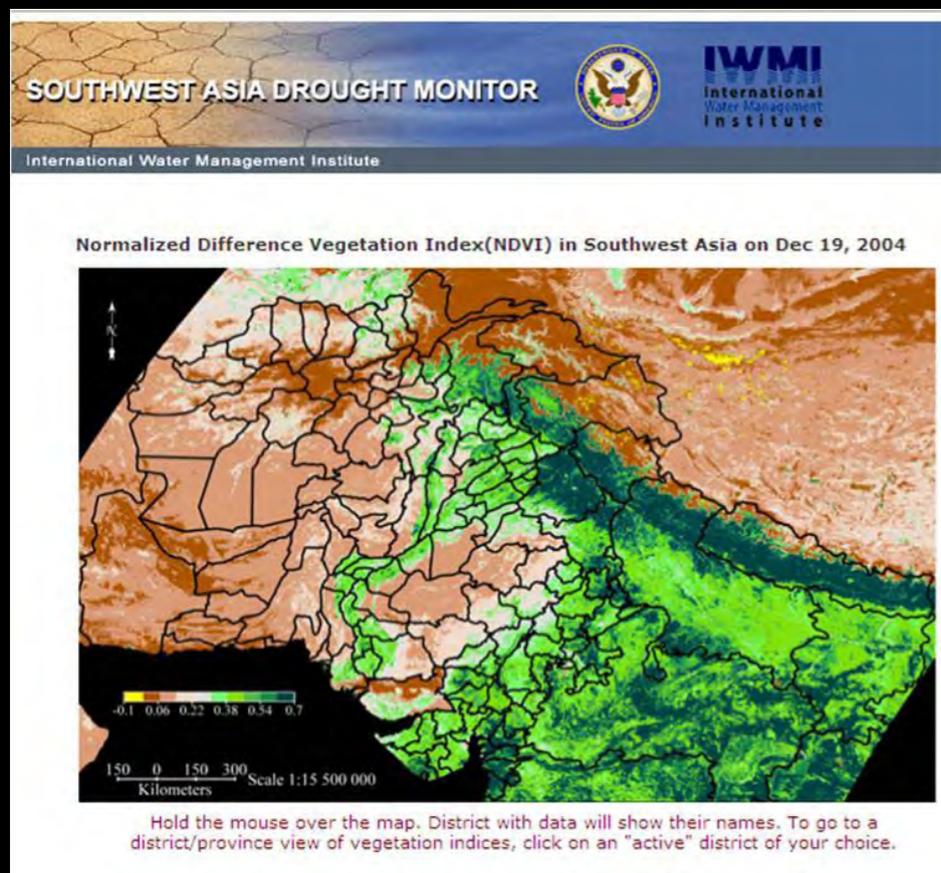




Environmental Monitoring and Management



- NASA has a network of Earth observing spacecraft with many applications, such as:
- Famine Early Warning Systems Network (FEWS NET) in Africa, providing early warning on emerging food security issues.
- The South Asia Drought Monitor (SADM) supplying timely information on drought onset, progression and areal extent.



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Estimated food security conditions, 2nd Quarter 2010 (April-June) [Enlarge](#)

A world map showing food security conditions in the 2nd Quarter of 2010 (April-June). The map is color-coded according to the FEWS NET Food Insecurity Severity Scale. The scale is: Generally Food Secure (green), Moderately Food Insecure (yellow), Highly Food Insecure (orange), Extremely Food Insecure (red), and Famine (dark red). The map shows significant areas of high and extremely high food insecurity in Africa and parts of Asia. A legend at the bottom right of the map provides the color key for the severity scale.

Environmental Monitoring and Management

- **NASA is helping countries of Central America with SERVIR, a satellite visualization system that monitors weather and climate.**
 - SERVIR helps track and combat wildfires, improve land use and agricultural practices, and respond faster to natural disasters.
 - Helped Dominican Republic's response to extensive flooding from Tropical Storm Noel.
- **NASA, the U.S. Agency for International Development (USAID) and their partners established SERVIR-Africa in Nairobi, Kenya.**
 - Integrates satellite resources into a Web-based Earth information system.
 - Helps address natural disasters, disease outbreaks, biodiversity and climate change.



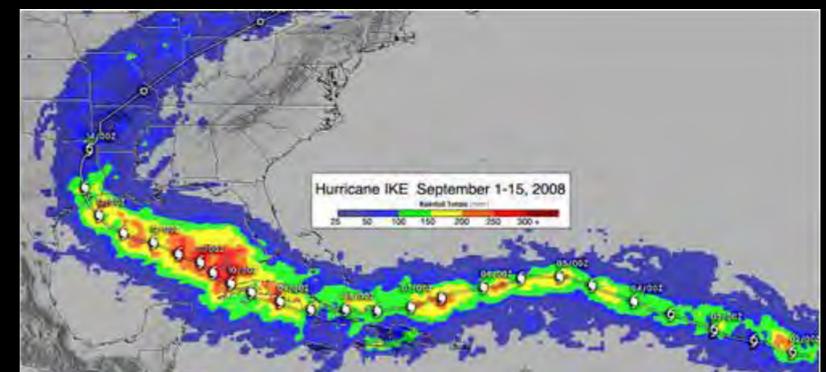
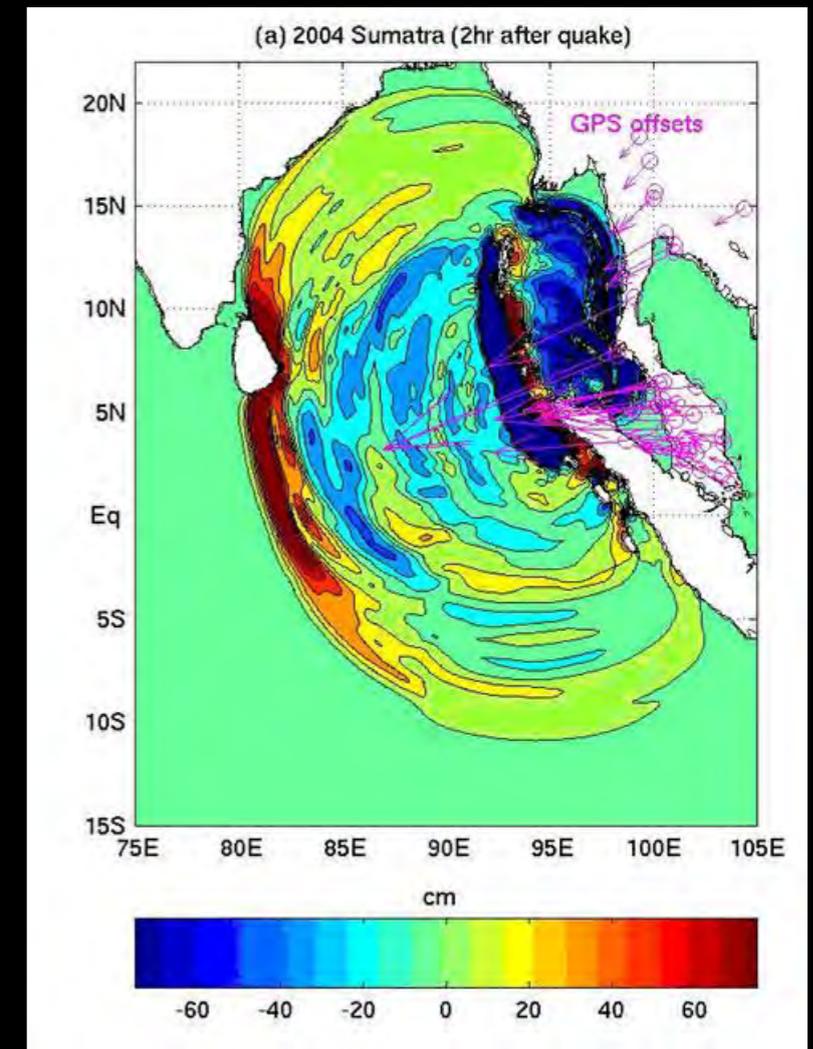
Fires in Central America



Nzoia River Basin in Kenya

Disaster Warning and Relief

- **Conventional tsunami warning systems can result in false tsunami alarms with negative societal and economic effects.**
 - Researchers at NASA's Jet Propulsion Laboratory have developed GPS-based methods of prediction leading to more reliable global tsunami warning systems, saving lives and reducing false alarms.
- **Data from NASA spacecraft and NASA research improve the accuracy of forecasts for landfall, track and intensity of hurricanes, and increases the lead-time for warnings for both hurricanes and floods.**
 - More accurate forecasts, enable improved decision-making and improved preparedness for these types of events.



Disaster Warning and Relief

- **Balakot, Pakistan, devastated in 2005 by earthquake, had refugees with no clean water until a NASA-derived water purification system was on the site.**
- **Also after 2005 earthquake, an individual delivered tens of thousands of space blankets, a NASA spinoff.**
- **After the Haiti earthquake this year, communications were enabled with GATR inflatable antenna, and structures are being assessed with NASA software.**





Telemedicine and Wireless Networks



- **NASA needs telemedicine for remote delivery of medical care for spaceflight missions.**
- **Remote regions have limited infrastructure.**
- **Space telemedicine technology is being applied in many locations around the world.**



Intelesense networks in Vietnam, Thailand and Iraq are improving public health monitoring.

In Ethiopia, a network links 126 remote medical clinics to 5 hospitals.

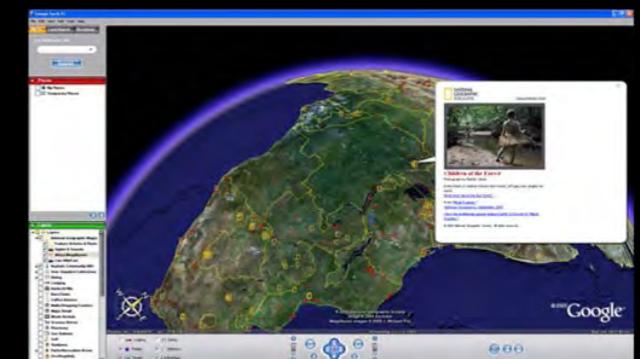


- **LAUNCH identifies and supports innovative work poised to contribute to sustainability of life on planet Earth.**
 - LAUNCH is convened by NASA in partnership with USAID, Department of State, and private entities.
 - LAUNCH leverages the collective expertise, networks and influence of a diverse community of leaders.
- **The inaugural event, LAUNCH: Water occurred on March 16-18, 2010 at NASA's Kennedy Space Center.**
- **The next event, LAUNCH: Health will occur on October 30-November 1 again at NASA's Kennedy Space Center.**



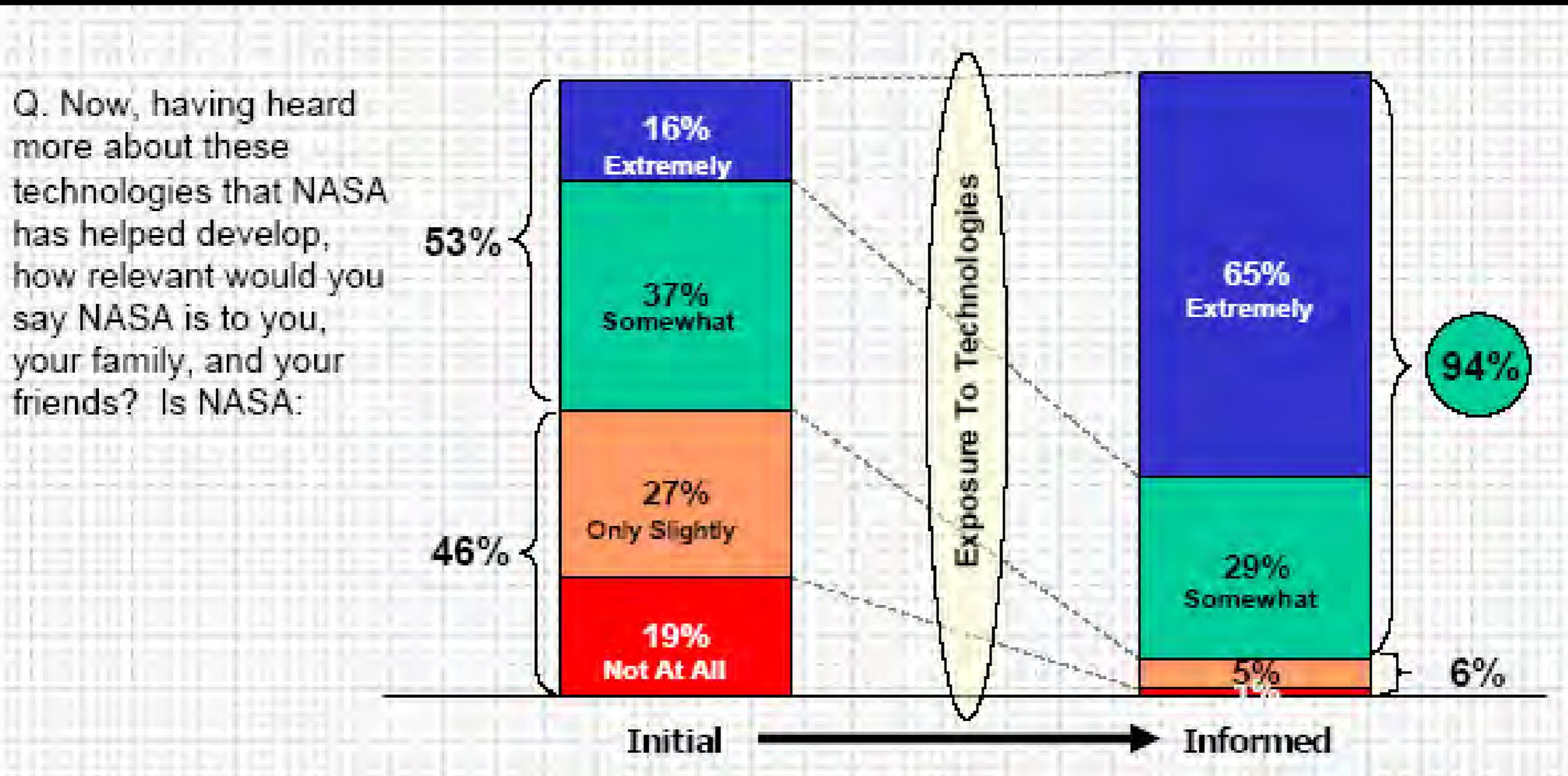
Educational Resources

- **GLOBE (Global Learning and Observations to Benefit the Environment) is a worldwide student-teacher-scientist partnership.**
 - It allows students to directly participate in research by helping collect global data.
 - Since 1995 GLOBE has grown to 110 countries 20,000 schools around the world.
- **The Global Connection Project is a joint project of Carnegie Mellon University, NASA, Google, and National Geographic.**
 - The project develops software tools and technologies to use images to connect, inform, and inspire people.
 - In collaboration with UNESCO, the project has distributed Gigapan to students in South Africa, and the Republic of Trinidad and Tobago.



Communicating Spinoff Benefits is Very Important

- Public perception of NASA's relevance to their everyday lives was altered dramatically when they were informed of some NASA spinoff benefits.



NASA Communication Tools

- Publications



- Internet



- Events



- Competitions

Trace space back to you!

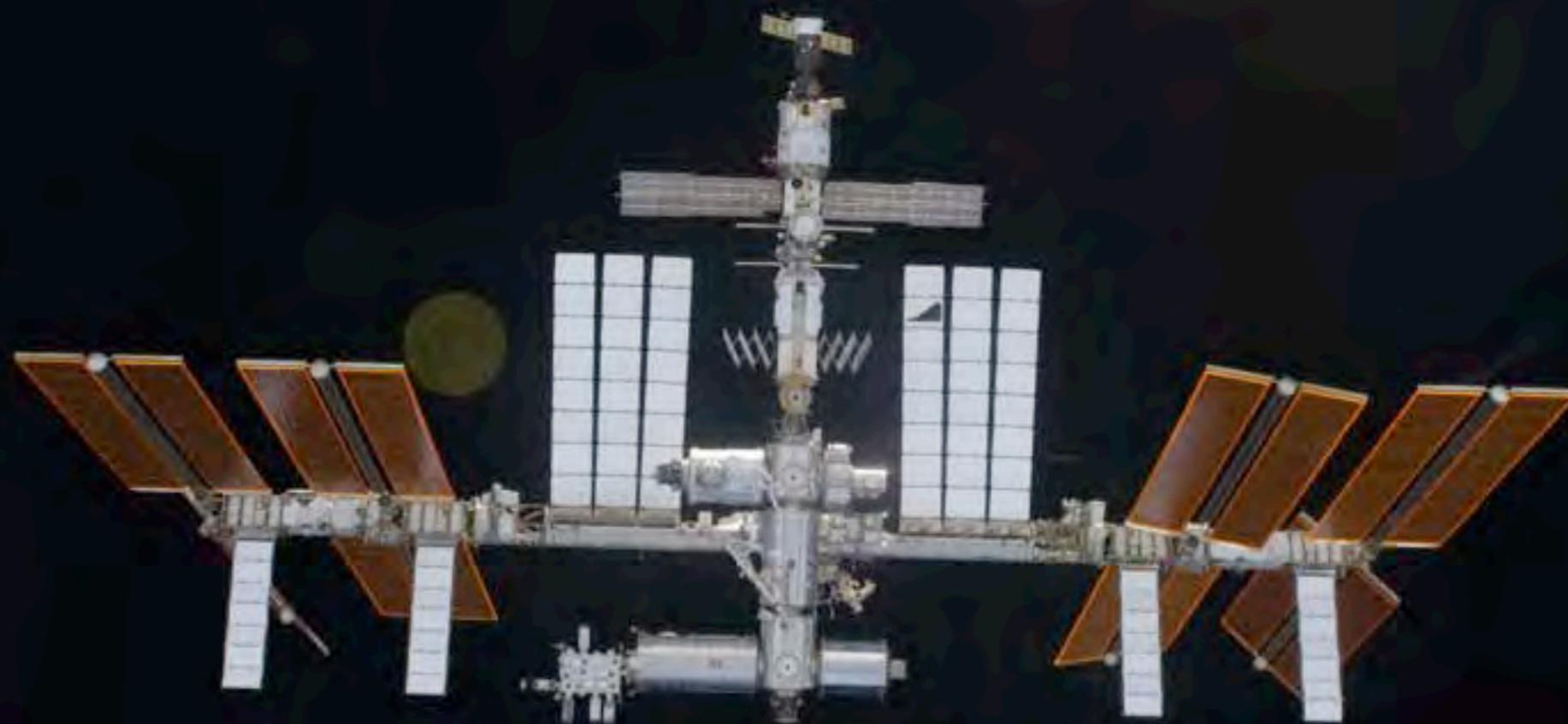
Have you ever wondered how space exploration impacts your daily life?
Pick a starting point to see how space traces back to you.



www.nasa.gov/city

SATELLITE	LOCAL DATE/TIME	DURATION (MIN)	MAX ELEV (DEG)	APPROACH (DEG-DIR)	DEPARTURE (DEG-DIR)
ISS	Tue Sep 14/08:27 PM	2	19	17 above WSW	15 above SSW
ISS	Thu Sep 16/07:46 PM	1	16	16 above SW	15 above SSW

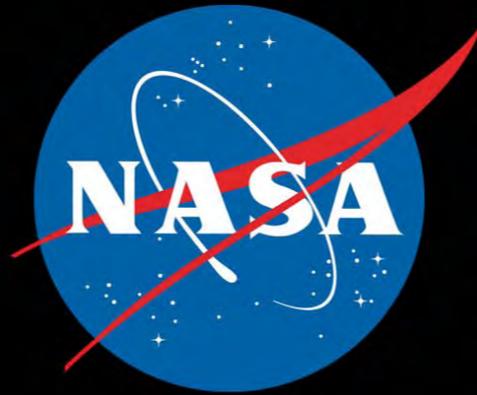
- **Good ISS viewing for Istanbul September 14 & 16**
- <http://spaceflight.nasa.gov/realdata/sightings/index.html>



- **STS-133 to launch NET November 1 to the ISS with the Permanent Multipurpose Module, the Express Logistics Carrier 4 and critical spares**

Summary

- **These examples provide a representative sample of the kinds of practical benefits coming from space.**
- **NASA is delivering on the mandate it received from Congress more than 50 years ago—to broadly disseminate its results for the benefit of all mankind.**
- **NASA stands ready to continue its progress of innovation and exploration, to inspire and enlighten.**
- **NASA's work will undoubtedly continue to yield amazing scientific discoveries and technological breakthroughs.**
- **As NASA pursues new challenges, we will continue to seek opportunities to apply what we learn for the betterment of the human condition and our planet.**



Please contact me with ideas or suggestions for partnerships:

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