

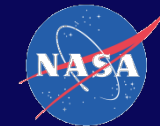


NASA MISSION: ENCOURAGING THE PURSUIT OF STEM EXCELLENCE



Dr. Maricela Lizcano
Research Materials Engineer
Materials Chemistry and Physics Branch
Materials and Structures Division
NASA Glenn Research Center

September 17, 2015



Background



- Parents from Monterrey, Mexico
- Number 7 of 8 children
- Grew up in the Rio Grande Valley in Edinburg, TX

- **2004 B.S. Mechanical Engineering**
 - **Research: Nano Reinforced Polymeric Materials - UTPA**
- **2006 M.S. Mechanical Engineering**
 - **Research: Electrorheology of C₆₀ Suspension Fluids-UTPA**
- **2011 Ph.D. Mechanical Engineering**
 - **Research: Low-Temperature Processing of Inorganic Polymers-TAMU**

NASA Glenn Research Center (GRC)



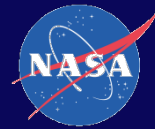
Cleveland, Ohio



NASA GRC : A Long History in Innovation and Excellence

- Originally established as the Aircraft Engine Research Laboratory (AERL), part of the National Advisory Committee for Aeronautics (NACA) in 1941.
- A national resource for innovations in aircraft engine technology, influencing commercial and military propulsion systems.
- Renamed the Lewis Research Center and became part of the new National Aeronautics and Space Administration (NASA) in 1958.
- In the early 1960s, Lewis pioneered the use of liquid hydrogen for rocket and aircraft propulsion, allowing the U.S. to win the race to the moon.
- Throughout the last 75 years, our scientists and engineers have advanced technology in both aviation and space exploration. These innovations have given the U.S. a leading role in the aerospace industry.





NASA GRC Work Profile

Aeronautics Research



Science



Mission Support



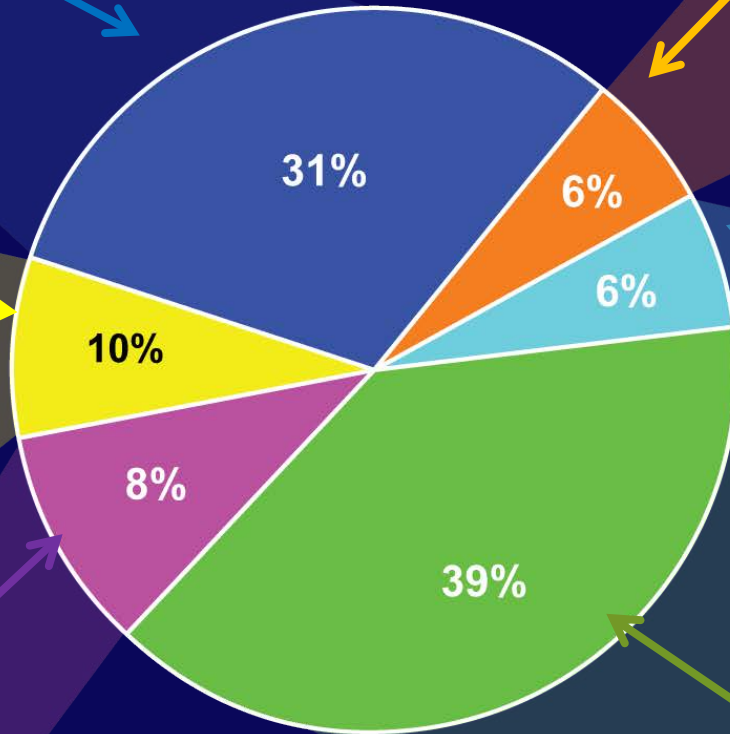
Space Operations

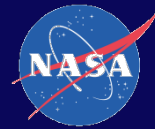


Cross Agency Support



Exploration Systems

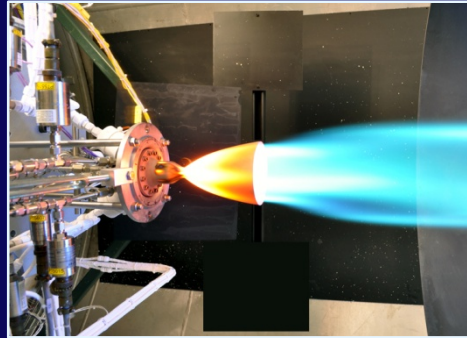




NASA Glenn Core Competencies



Air-Breathing Propulsion



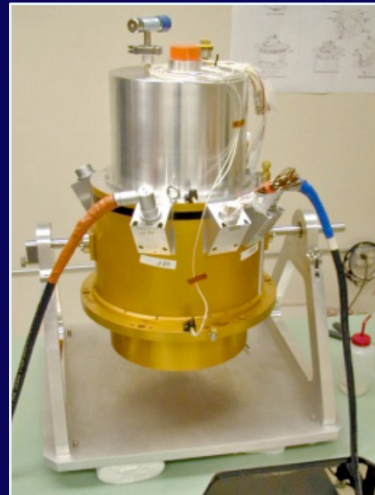
**In-Space Propulsion and
Cryogenic Fluids Management**



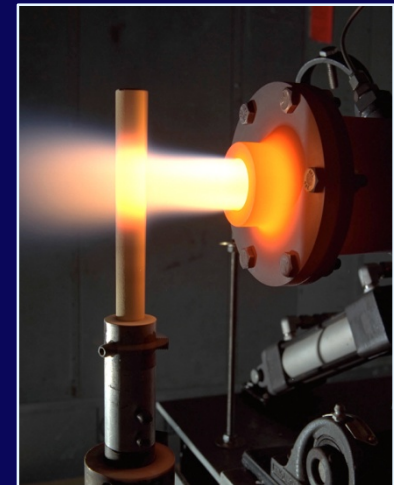
**Physical Sciences and
Biomedical Technologies in Space**



**Communications Technology
and Development**



**Power, Energy Storage and
Conversion**

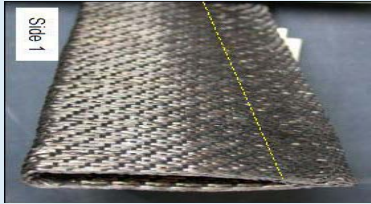


**Materials and Structures
for Extreme Environment**

Materials and Structures Division

High Temperature Materials

Ceramic Matrix Composite



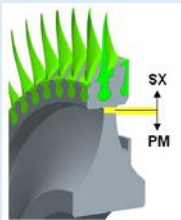
Protective Coatings



Thermal Protection Seal

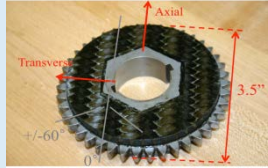


Hybrid Disk

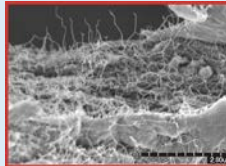


Lightweight Concepts

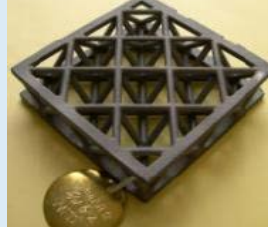
Hybrid Composite



Nanotube Yarn



Lattice Block

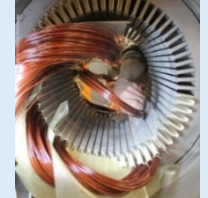


Flexible Aerogel



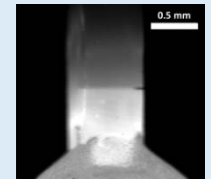
Electric Propulsion Materials

Materials for High Power Density Electric Motors



Silicon Carbide Semiconductor

Lightweight Power Transmission Cable



Mechanisms and Drive Systems

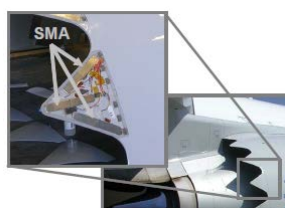
High Efficiency Gear



Superelastic Bearing



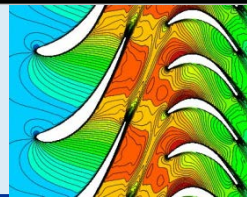
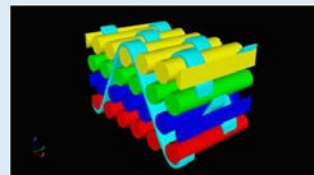
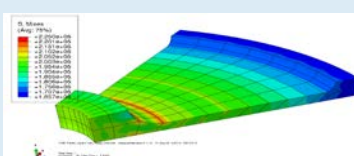
Shape Memory Alloy-Based Actuation



Spring Tire

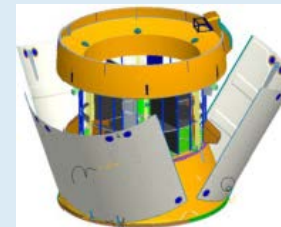


Computational Modeling



Flight Structures

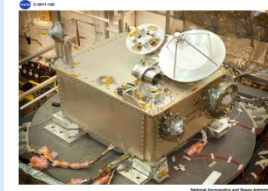
Orion Fairing Jettison



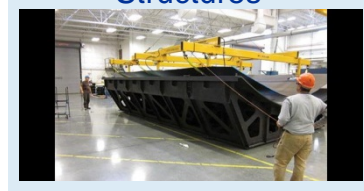
Low Impact Docking Seal



Vibration Testing

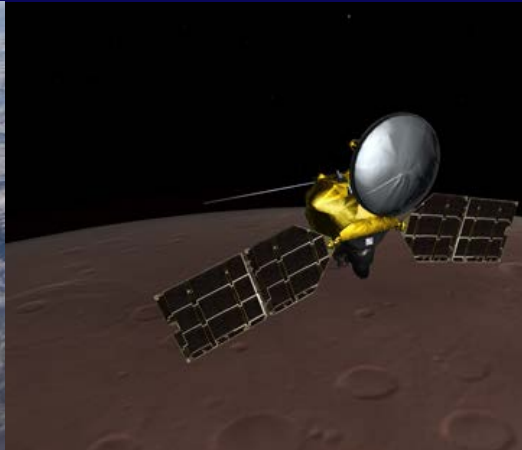


Large Composite Structures



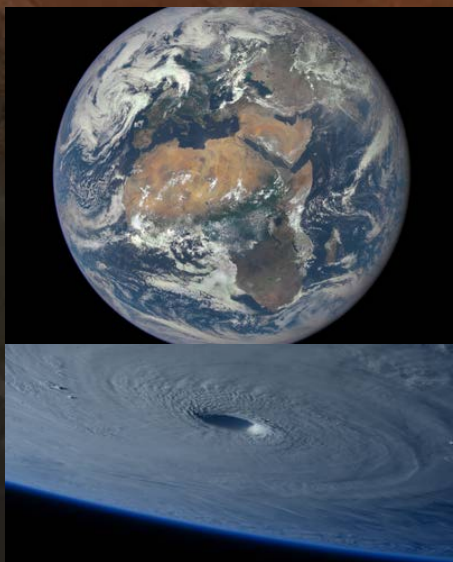
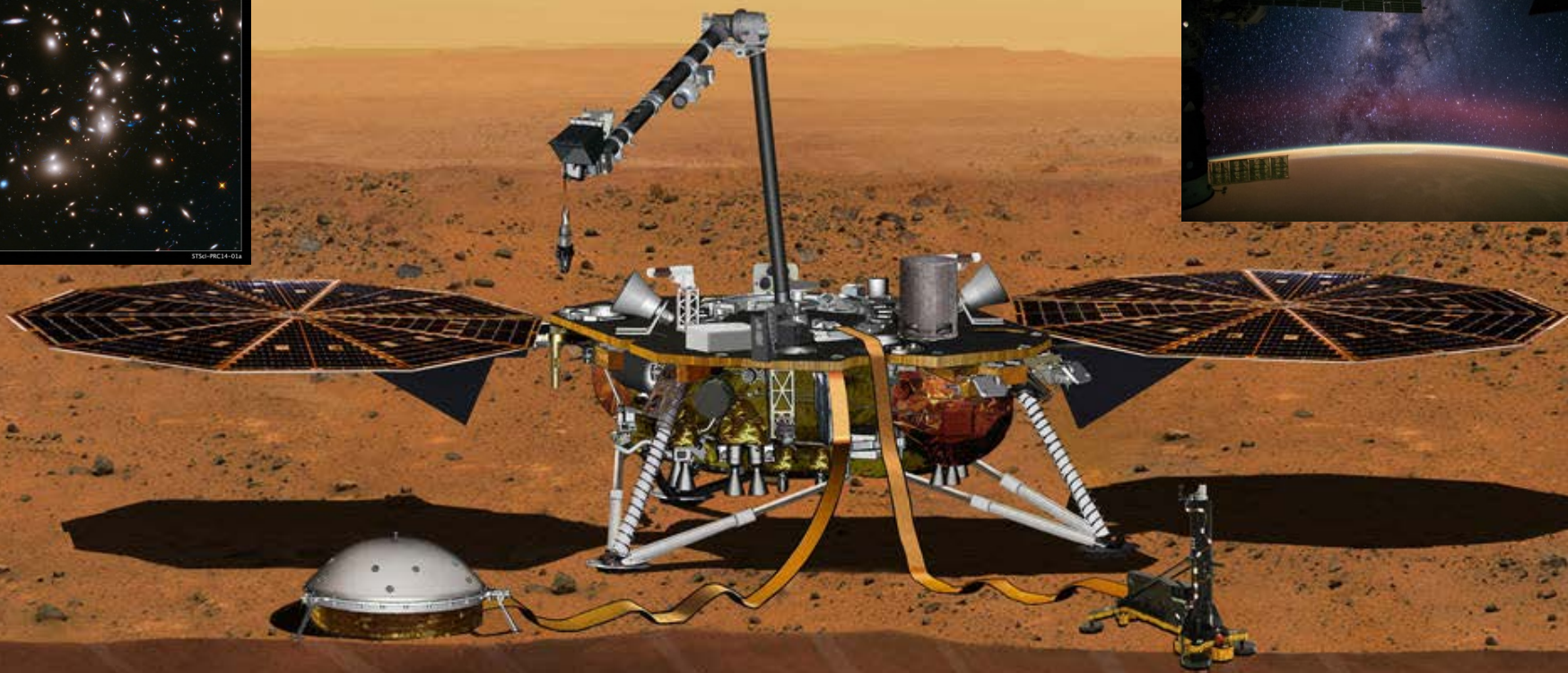


Why Does NASA Have a High Standard of STEM Excellence?



It's Obvious!





NASA's missions to explore our world, our solar system, our galaxy and our universe presents extraordinary complex challenges. These challenges can only be met with excellence in STEM education, innovation, and a lot of hard team work.

A photograph of a Space Shuttle Columbia being launched from the launch pad. The shuttle is ascending vertically, leaving a massive, bright white and orange plume of fire and smoke behind it. The launch pad structure is visible on the left side of the frame. The sky is a clear, pale blue. The overall scene is one of powerful energy and technological achievement.

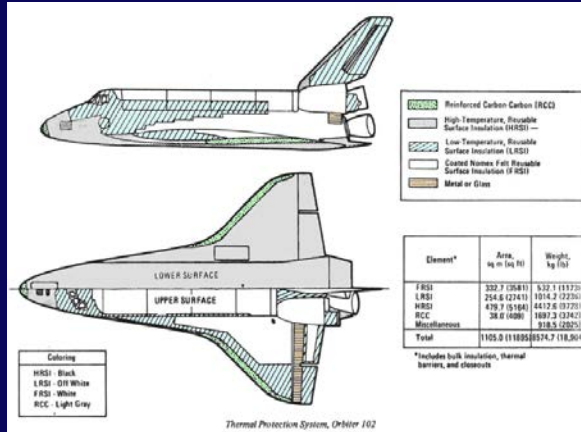
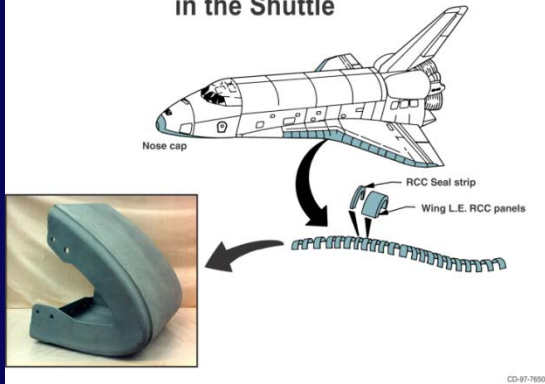
Examples of Excellence in Materials Science



Thermal Protection Systems

High Temperature Reusable Surface Insulation (HTRSI)

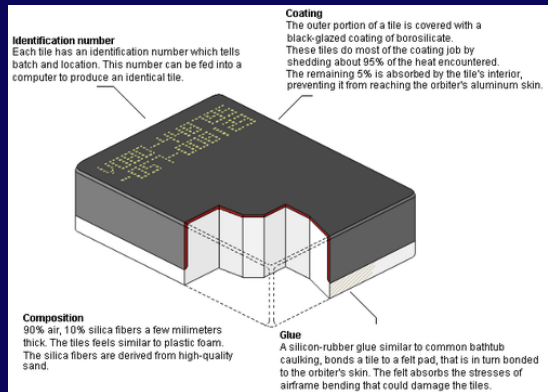
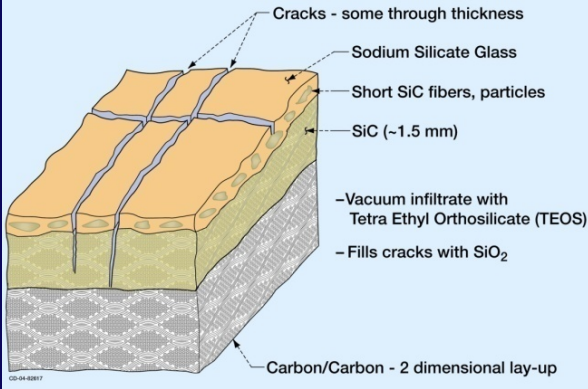
Reinforced Carbon/Carbon (RCC) in the Shuttle



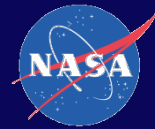
Re-entry Environment



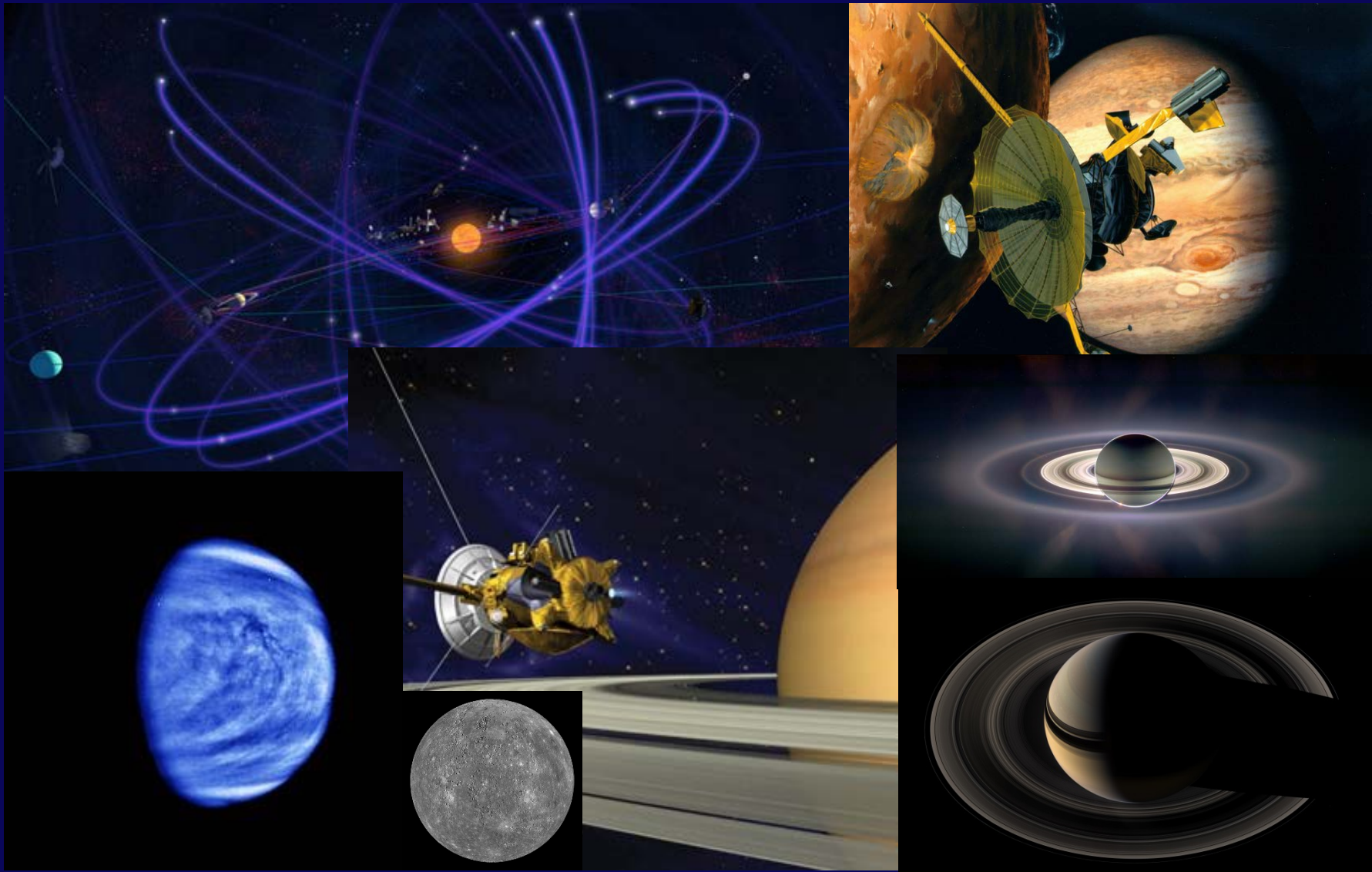
Coated Reinforced Carbon/Carbon Composite



- Temperature to 2000 K
- Reduced pressure--0.005 to 0.010 atm
- Gases--O₂, N₂, CO₂
- Shock leads to O, N and ions
- Short times ~15 minutes/re-entry
- Best simulated with arc-jet



Radioisotope Power Systems (RPS) For Deep Space Exploration



Where Does Excellence Begin?

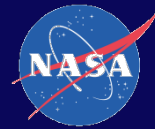
Look in a mirror!
It begins with **YOU!**



It's your **CHOICE!**

Traits of Excellence

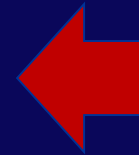
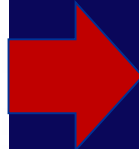
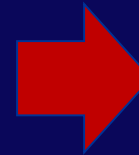
- Dedication
- Determination
- Resilience
- Perseverance
- Flexibility
- Tenacity
- Integrity
- A perhaps a little bit of confidence!



To Achieve Excellence in All Endeavors, A Plan Must be in Place



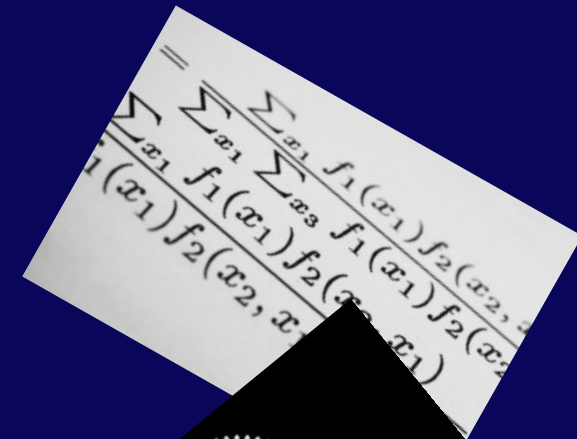
Ask yourself...
What?
How?
Where?
When?
Who?





Strategies to Achieve Excellence

- Develop Plans-Plan A and Plan B if you need it!
- Prepare
- Apply Time-Management
- Develop Skills
 - Technical Undergraduate Work
 - Mechanical Engineering-Research
 - Physics- Research and Lab Instructor
 - Mathematics- Research
 - Internships-NREL Internship and REU at UTPA and Vanderbilt University
 - Non-technical Management work: HESTEC 2004 - 2005 Student Competition Coordinator
- Learn From Failure-Plan B!!! The Plan may change but the GOAL is the same!
- Utilize Resources
- Never Give Up and Keep Your Eyes on the PRIZE!



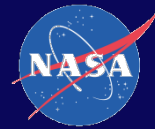


The Results of Planning and Hard Work

RESULTS: A STRONG COMPETITIVE RESUME
Highlighting Academic Achievements, Work Ethics
and Skills.

REWARDS: OPPORTUNITIES!





The Day All The Hard Work PAID OFF!

Monday, April 25, 2011 11:51 AM

NASA Glenn Ceramics Branch Monday, April 25, 2011 11:51 AM

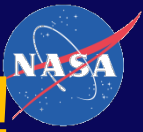
From: "Grady, Joseph E. (GRC-RXC0)" [REDACTED]

To: "Maricela Lizcano" [REDACTED]

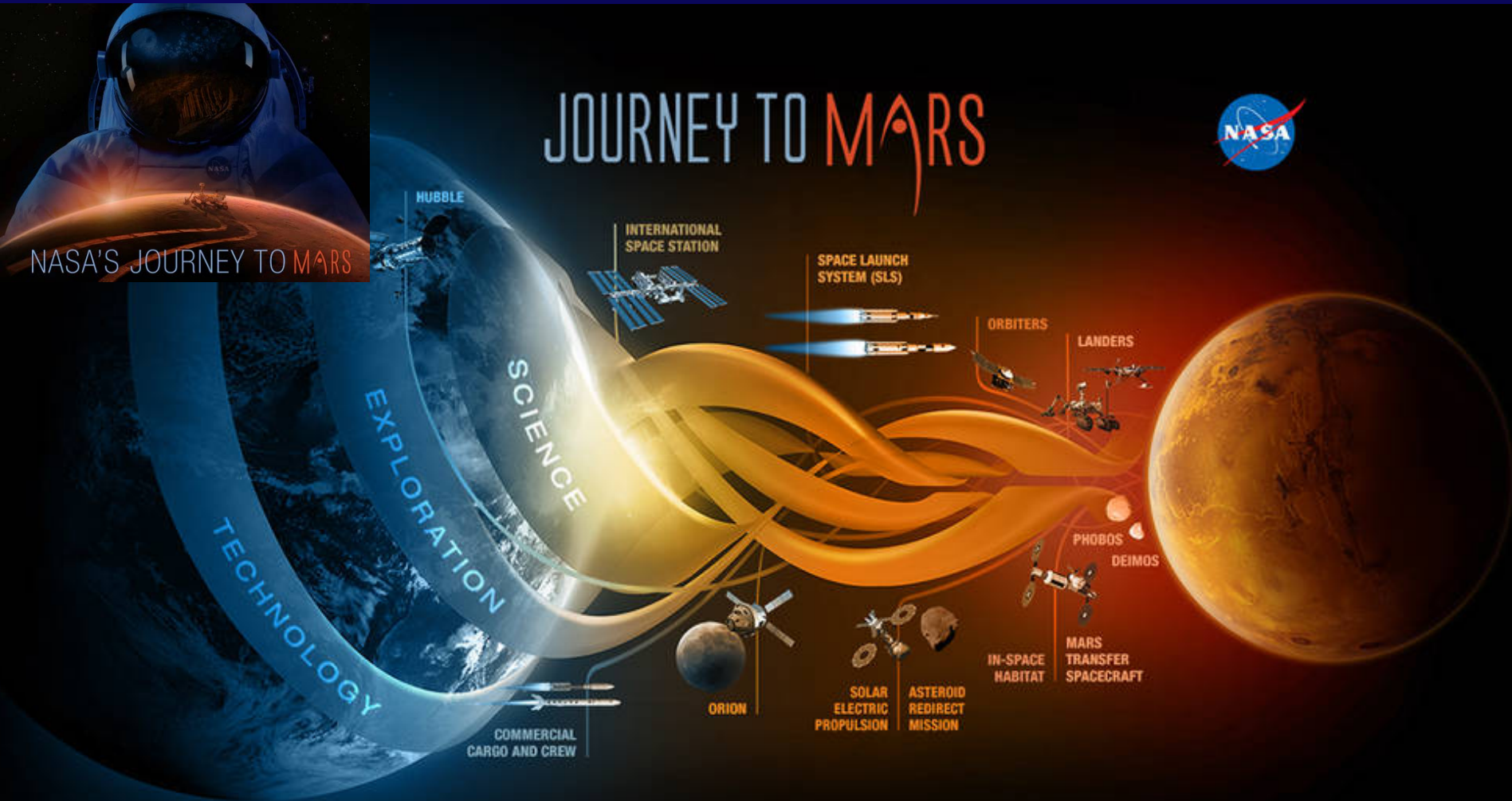
Maricela – I recently received your
the Ceramics Branch at NASA
ceramic components
cells. I
to talk
brief so

Thanks
Joe Grady
Chief, Cer
NASA Gle

NASA!!!

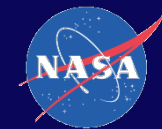


Preparation and Planning Can Take You Far!



NASA'S JOURNEY TO MARS

<https://www.youtube.com/watch?v=pwipxdQ74pU>



CHOOSE to Pursue Excellence in STEM



The Rewards Are Out of This World...





NASA Opportunities

- Pathways Program
 - Prepares students for careers by providing related work experience
 - Rotates scheduled work sessions with school
- Pathways Intern and Recent Graduate Positions:
 - www.usajobs.gov
 - Example-Search “glenn pathways”
 - For PMF-STEM visit www.pmf.gov
- Regular Full-Time Positions:
 - www.usajobs.gov
 - Search “glenn research center”
- Other Student Opportunities:
 - <https://intern.nasa.gov>
 - Search Opportunities
 - Limited opportunities for international students

Just for fun...Your Next Picnic!

