NASA MISSION: ENCOURAGING THE PURSUIT OF STEM EXCELLENCE

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Materials and Structures Division
NASA Glenn Research Center

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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 C_{60} Suspension Fluids-UTPA**
- **2011 Ph.D. Mechanical Engineering**
  - **Research: Low-Temperature Processing of Inorganic Polymers-TAMU**

NASA Glenn Research Center (GRC)

Cleveland, Ohio

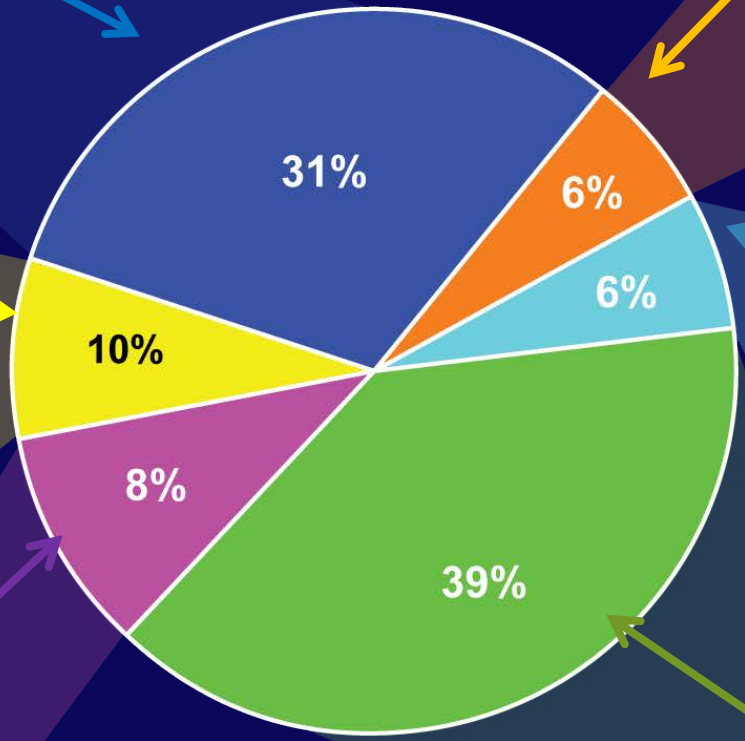
NASA GRC : A Long History in Innovation and Excellence

- 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

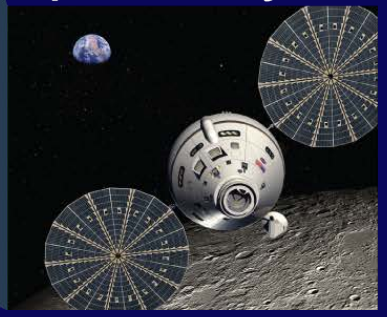


Mission Support

Space Operations

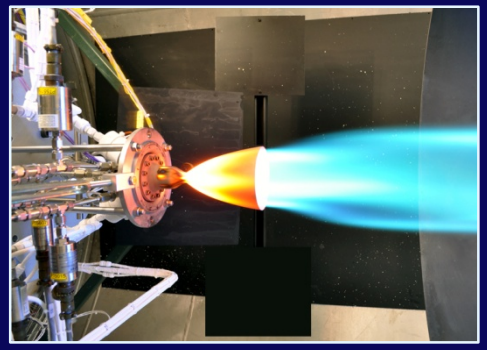
Cross Agency Support

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

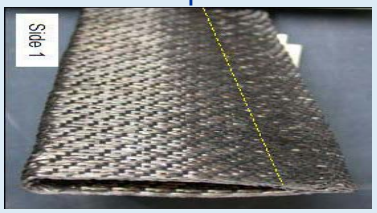
Materials and Structures for Extreme Environment

National Aeronautics and Space Administration

Materials and Structures Division

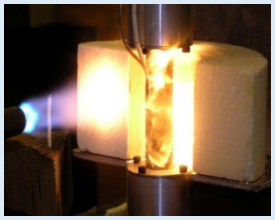
High Temperature Materials

Ceramic Matrix Composite

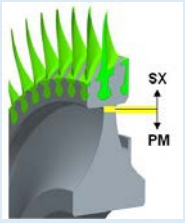


Protective Coatings

Thermal Protection Seal

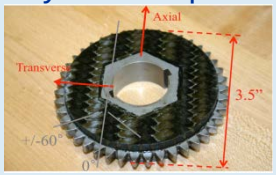


Hybrid Disk

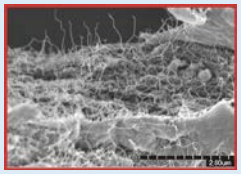


Lightweight Concepts

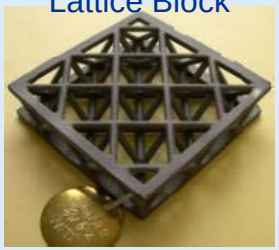
Hybrid Composite



Nanotube Yarn



Lattice Block



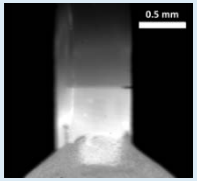
Flexible Aerogel

Electric Propulsion Materials

Materials for High Power Density Electric Motors

Lightweight Power Transmission Cable

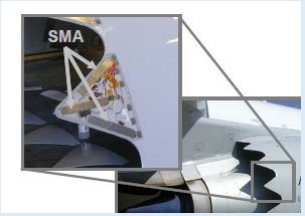
Silicon Carbide Semiconductor



Mechanisms and Drive Systems

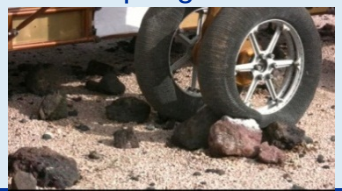
High Efficiency Gear

Shape Memory Alloy-Based Actuation

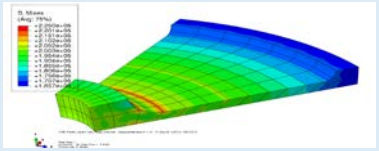


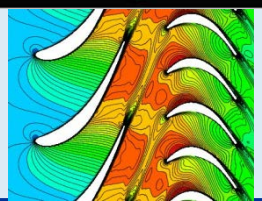
Superelastic Bearing

Spring Tire



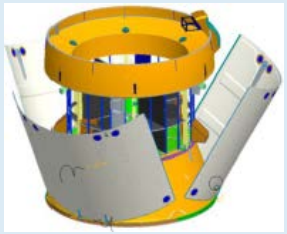
Computational Modeling





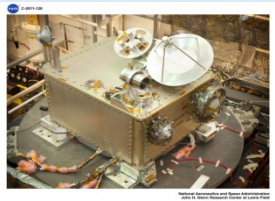
Flight Structures

Orion Fairing Jettison



Low Impact Docking Seal

Vibration Testing



Large Composite Structures

National Aeronautics and Space Administration

Why Does NASA Have a High Standard of STEM Excellence?

It’s Obvious!

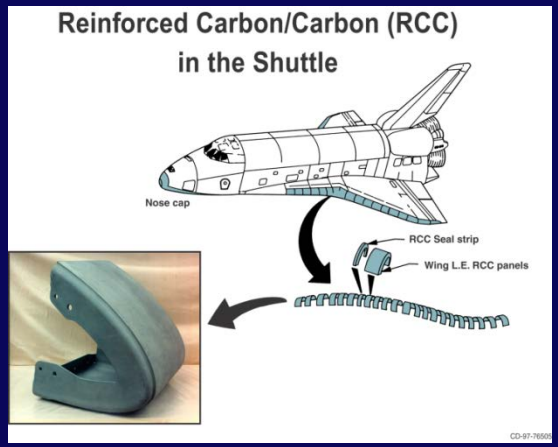
NASA's missions to explore our world, our solar system, our galaxy and our universe presents extraordinary complex challenges. These challenges can only be met with excellence in STEM education, innovation, and a lot of hard team work.

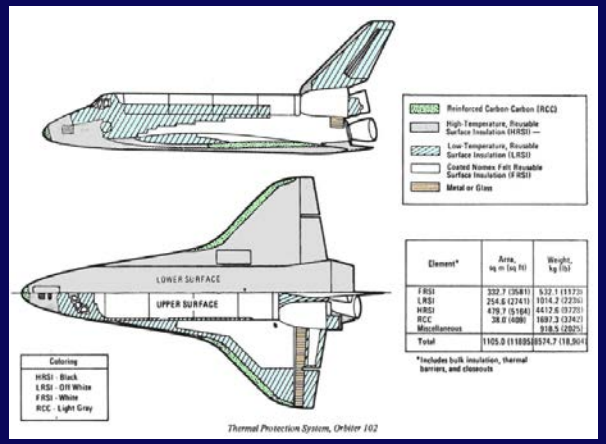
Examples of Excellence in Materials Science

Thermal Protection Systems

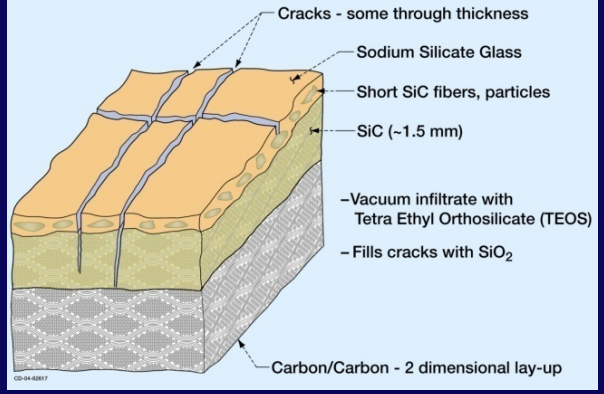
High Temperature Reusable Surface Insulation (HTRSI)

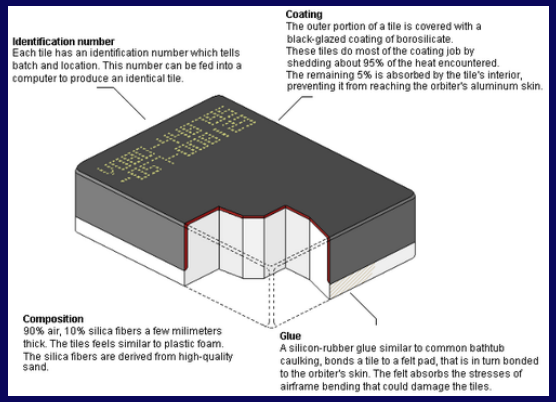
Reinforced Carbon/Carbon (RCC) in the Shuttle





Coated Reinforced Carbon/Carbon Composite





Re-entry Environment

- Temperature to 2000 K
- Reduced pressure--0.005 to 0.010 atm
- Gases--O_2, N_2, CO_2
  - 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?

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

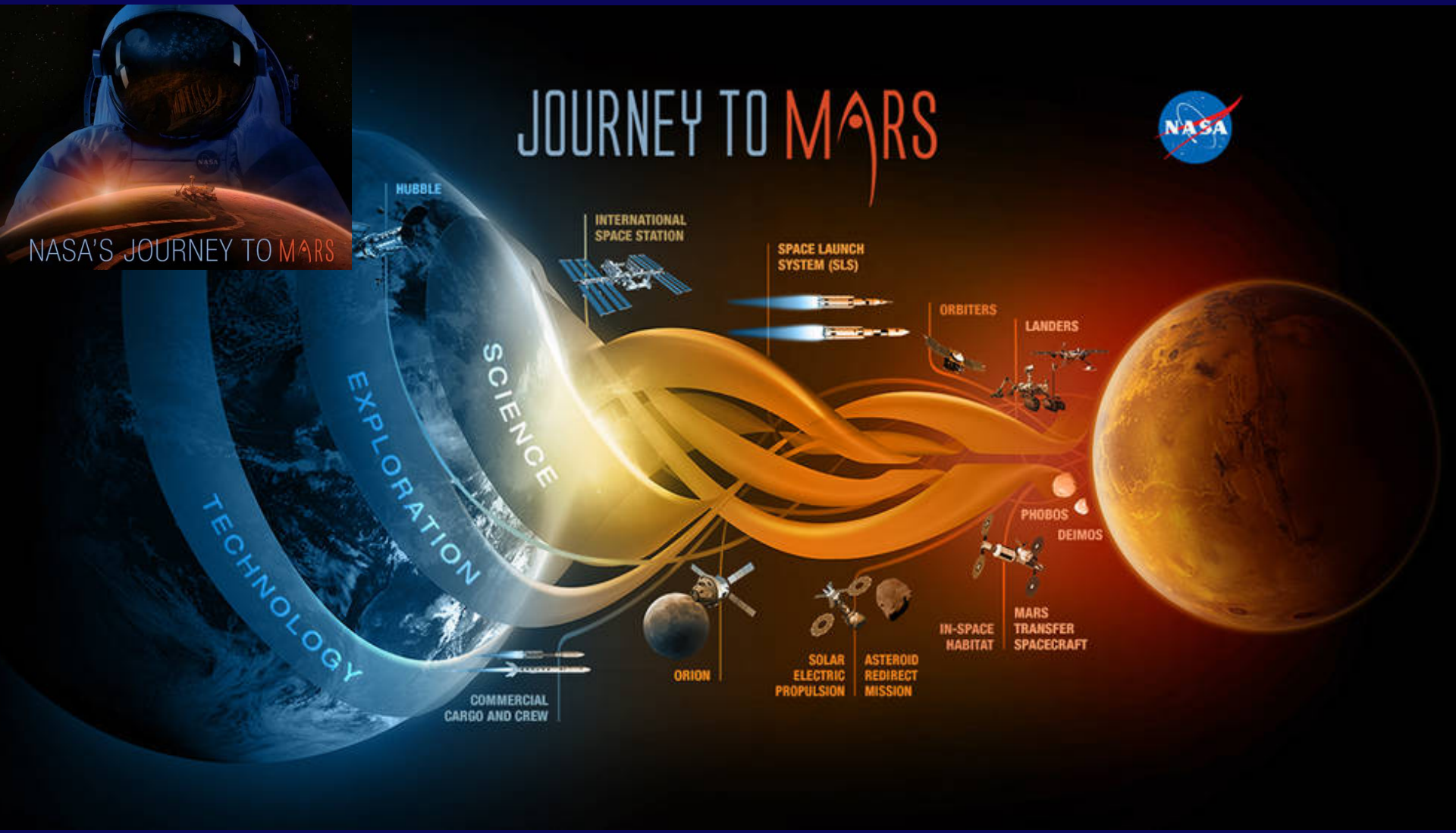
NASA Glenn Ceramics Branch Monday, April 25, 2011 11:51 AM
From:"Grady, Joseph E. (GRC-RXC0)" [redacted]
To: “Maricela Lizcano” [redacted]

Maricela – I recently received your [illegible] in the Ceramics Branch at N[illegible] ceramic compo[illegible] cells. [illegible] to talk [illegible] give a brief s[illegible]

Thanks
Joe Grad[illegible]
Chief, Cer[illegible]
NASA Gle[illegible]

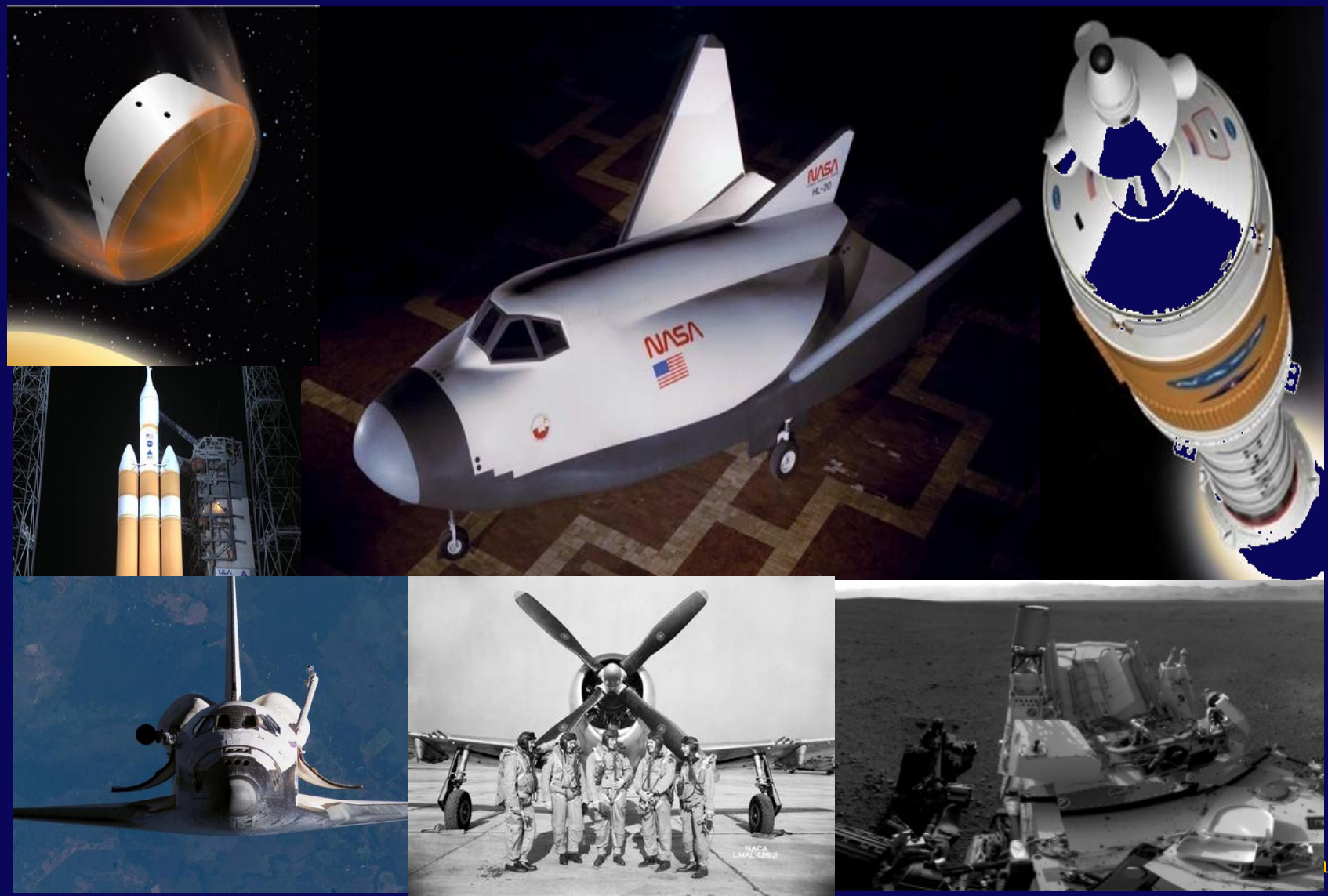
NASA!?!

Preparation and Planning Can Take You Far!



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

CHOOSE to Pursue Excellence in STEM



The Rewards Are Out of This World…

NASA Opportunities

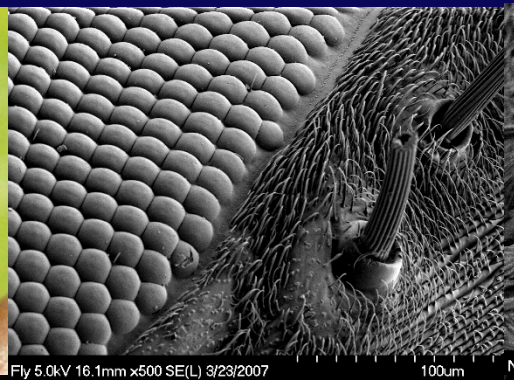
- Pathways Program
  - Prepares students for careers by providing related work experience
  - Rotates scheduled work sessions with school

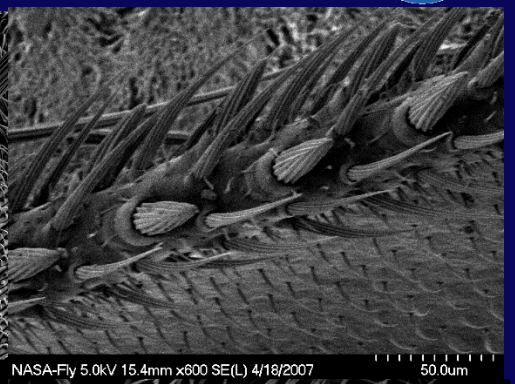
- Pathways Intern and Recent Graduate Positions:
  - www.usajobs.gov
  - Example-Search “glenn pathways”
  - For PMF-STEM visit www.pmf.gov

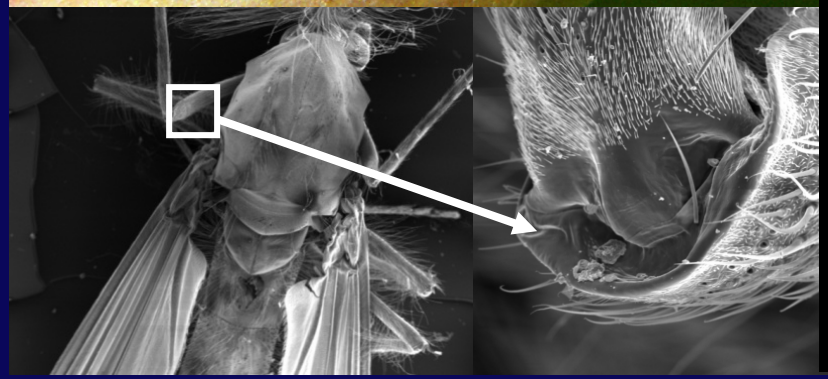
- Regular Full-Time Positions:
  - www.usajobs.gov
  - Search “glenn research center”

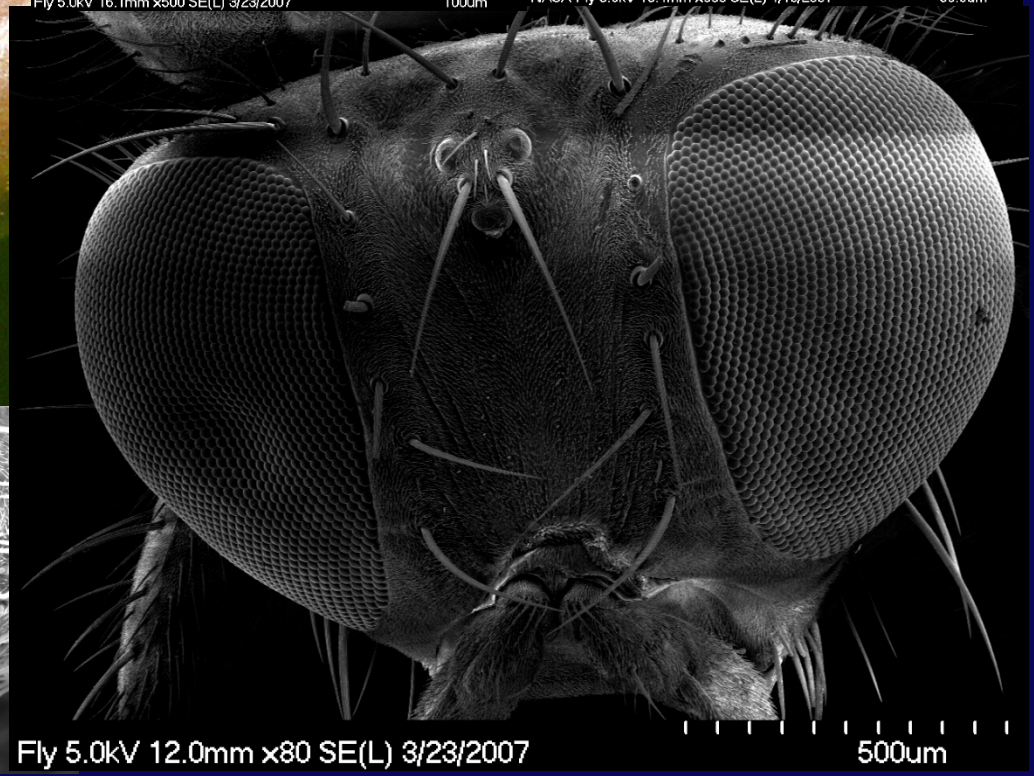
- Other Student Opportunities:
  - https://intern.nasa.gov
  - Search Opportunities
  - Limited opportunities for international students

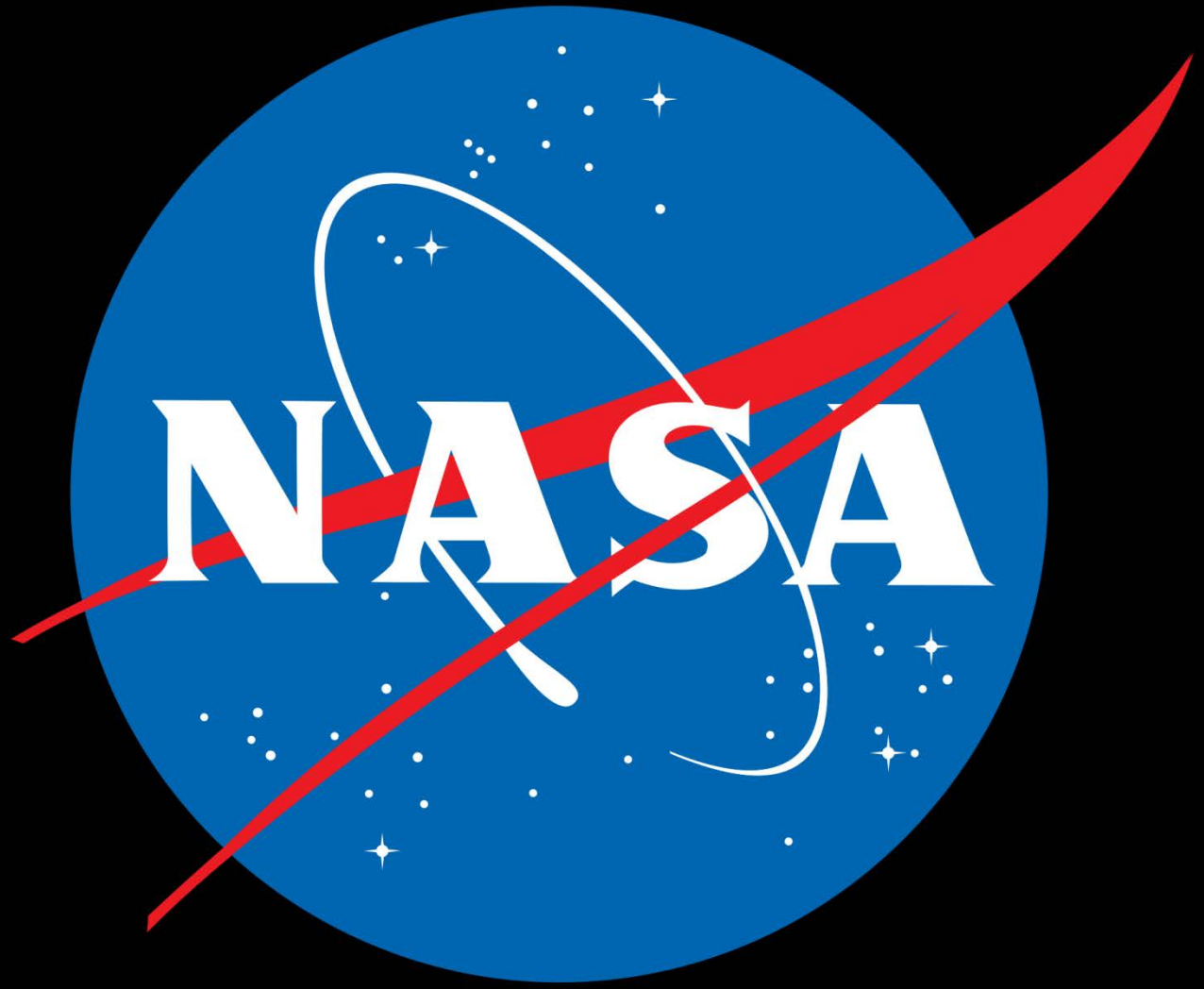
Just for fun...Your Next Picnic!










NASA