

The Next Generation of Explorers
GRC Update - Overview & Opportunities for Collaboration
By

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Presented at

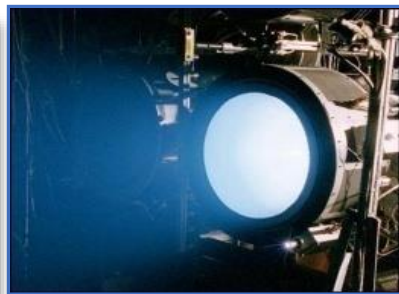
Mid-Atlantic Regional Space Grant Mtg.
Charleston, WV / Sept. 13, 2019

Outline

- **GRC Overview**
- **Opportunities for Collaboration / Technologies for Advanced Concepts**
- **GRC Engagement Portfolio**
- **Public Outreach**
- **Spring'20 Internship Opportunities for Students**
- **Contact Information**
- **Useful Links**
- **Questions**

Center Overview - Vision and Mission

- **NASA Vision:** To discover and expand knowledge for the benefit of humanity.
- **NASA Mission:** -Lead innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and bring new knowledge and opportunities back to Earth.
 - Support the growth of the Nation's economy in space and aeronautics, increase understanding of the universe and our place in it, work with industry to improve America's aerospace technologies, and advance American leadership.
- **Glenn Mission:** -Drive research, technology, and systems to advance aviation, expand human presence across the solar system, enable exploration of the universe, and improve life on Earth.



GRC Overview - Glenn Campuses



Lewis Field (Cleveland)

- 350 acres
- 1486 civil servants and 1,528 contractors
- 75 Pathways Interns (not included above)



Plumbrook Station (Sandusky)

- 6500 acres
- 24 civil servants and 105 contractors
- 1 Pathways Intern (not included above)

Center Overview - Glenn Civil Service Workforce

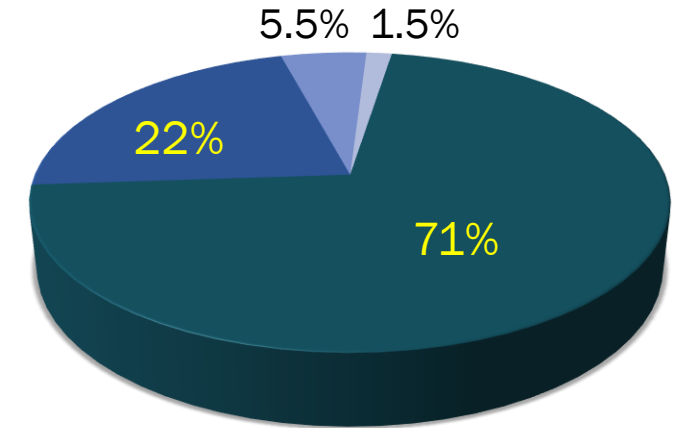
- 68 percent of the workforce charge their time directly to technical missions
- 68 percent of scientists and engineers earned advanced degrees, 24 percent with Ph.D.'s



Administrative
and Clerical

Scientists and
Engineers

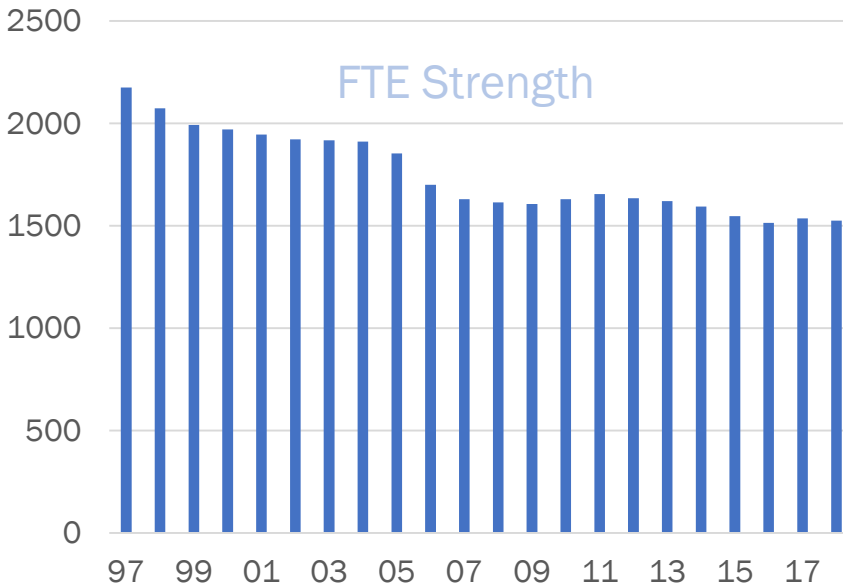
Skilled
Craftsman



- Scientists and Engineers
- Administrative Professional
- Skilled Craftsmen
- Clerical

Administrative
Professional
21%

FTE Strength



Center Overview – Glenn Economic Impact

Employees Contribute **\$90M** in State and Local Income Taxes

Impact	Northeast Ohio	State of Ohio
Output	\$1.4 B	\$1.5 B
Value Added	\$742 M	\$776 M
Employment	\$7,271 Jobs	7,603 Jobs
Labor Income	\$485 M	\$511 M
Taxes	\$124 M	\$129M

NOTE: Data from an Economic Impact Study prepared by Cleveland State Univ., June 2018

Center Overview - Glenn Awards and Recognition



R&D 100 Awards

Total of 125 awards, highest in the Agency, in these disciplines

- Propulsion systems
- Materials and structures
- Aerospace communications
- Power and energy conversion



Collier Trophy

- Contributions to airline accident reduction (2008)
- Advance turboprop technology (1988)
- Thermal ice prevention systems (1946)



Patents

- Currently
 - 167 to Glenn
 - 175 to Glenn partners



Federal Laboratory Consortium

- 17 FLC National Awards
- 11 FLC Midwest Awards



Space Technology Hall Of Fame

- Software Defined Radio
- GATR ground antenna transmit and receiver
- ACTS communication satellite
- PMR-15 Polymide resin



Emmy

- Contributions to the Communications Technology Satellite (1987)



NASA Software of the Year

- 1 Winner 4 Co-winners
- 7 Runner-ups
- 2 Honorable Mentions

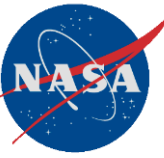
NASA Invention of the Year

- 2 Winners • 2 Runner-ups
- 5 Honorable Mentions



Presidential Rank (2005 to 2018)

- 25 Meritorious
- 7 Distinguished



Opportunities for Collaboration - Areas of Expertise -Strong Foundation

Expertise helps to meet GRC commitments/Grow Center in areas for its future



Aircraft Propulsion



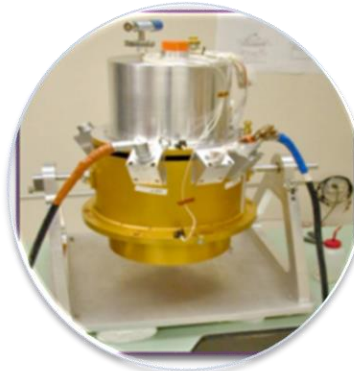
Space Propulsion
and Cryogenic Fluids



Physical Sciences and Biomedical
Technologies in Space



Communications Technology
and Development



Power, Energy Storage
and Conversion



Materials and Structures
For Extreme Environments



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Opportunities for Collaboration-NASA Aeronautics Programs



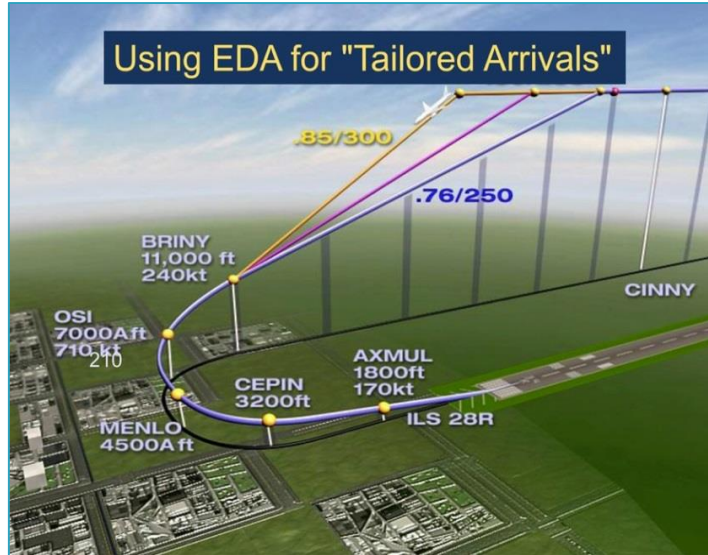
Advanced Air Vehicle Program

- Enable new aircraft to **fly safer, faster, cleaner, quieter, and use fuel efficiently.**
- **Innovative design concepts** developed for advanced vehicles **integrate multiple, simultaneous vehicle performance considerations** that focus on fuel burn, noise, emissions and intrinsic safety.

Transformative Aeronautics Concepts Program

- **Cultivates multi-disciplinary, revolutionary concepts** to enable aviation transformation.
- Sharply **focused research** provides **flexibility** for innovators to **explore technology feasibility** and provide the knowledge base for radical transformation.

Opportunities for Collaboration-NASA Aeronautics Programs



Airspace Operations and Safety Program (AOSP)

- **AOSP works** with the Federal Aviation Administration, industry and academic partners to conceive and develop Next Generation Air Transportation System (NextGen) technologies to further improve the safety of current and future aircraft.



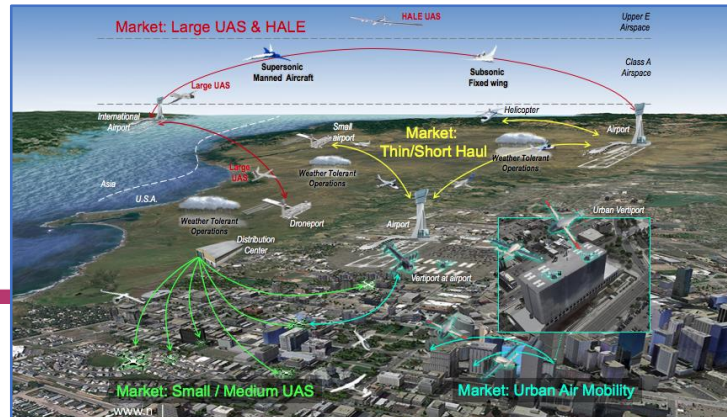
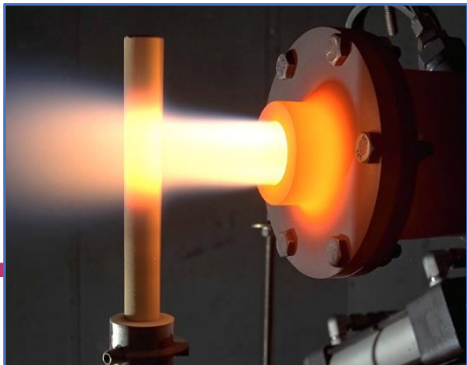
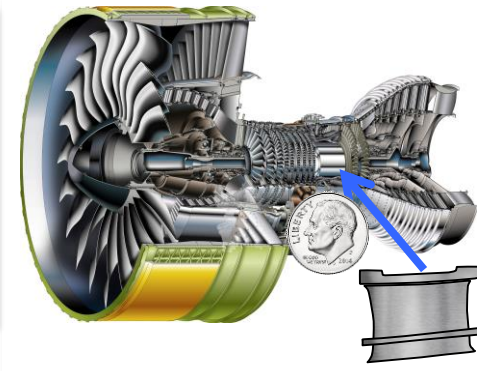
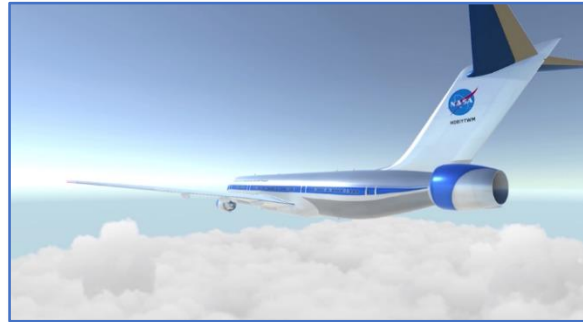
Integrated Systems Research Program

- **Conducts** flight-oriented, integrated, system-level research & technology development that supports flight research needs across the ARMD strategic thrusts, the programs and their projects. IASP is focused on rigorous execution of complex flight tests & related experiments.

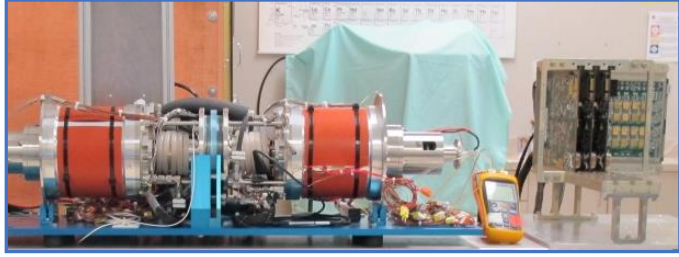
Technologies for Advanced Concepts

NASA Glenn - Aeronautics

- Supersonics
- Advanced Propulsion and Airframe Integration
- Electrified Aircraft
- Small Core
- Engine and Airframe Icing
- Propulsion Acoustics
- Hypersonics
- Urban Air Mobility

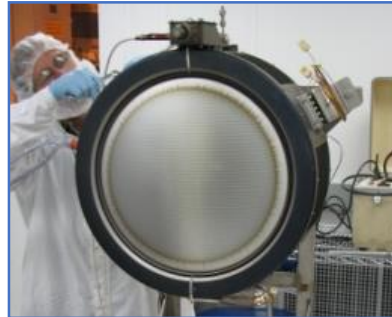
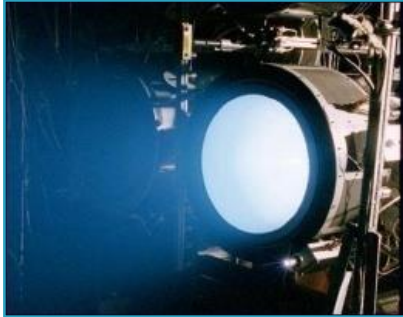


Space Science



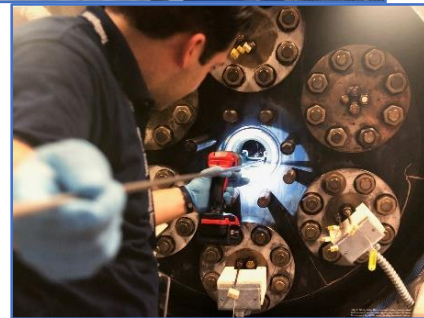
Radioisotope Power Systems (RPS)

- RPS Program Management
- Dynamic Power Conversion Technology



Planetary Science

- NASA Evolutionary Xenon Thruster – Commercial (NEXT-C) for future science missions (DART, CAESER)
- Extreme environment testing facilities
 - Glenn Extreme Environments Rig (GEER)
 - World-class capability to simulate harsh environments, such as on Venus
- Venus missions and instruments



Earth Science

- Airborne hyperspectral monitoring of harmful algal blooms (Lake Erie)



Human Exploration

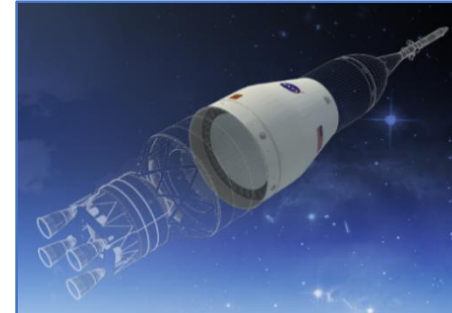
Orion Multi-Purpose Crew Vehicle (MPCV)

- Lead European Service Module (ESM) integration
- Conduct Orion/ESM testing at Plum Brook Station
- Support Vehicle Integration and Production Operations



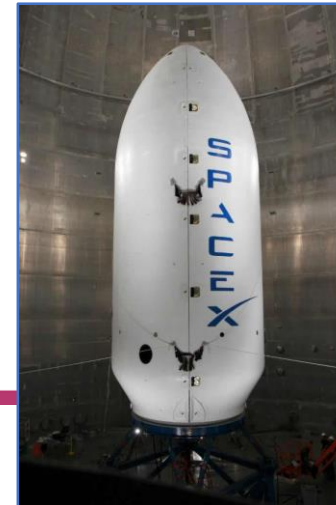
Space Launch System (SLS)

- Lead Universal Stage Adapter (USA)
- Lead the fairing development for the cargo version of SLS



Commercial Crew/Cargo

- Reimbursable Space Act Agreements for engineering support and testing
 - SpaceX
 - Sierra Nevada
 - Boeing
 - Others

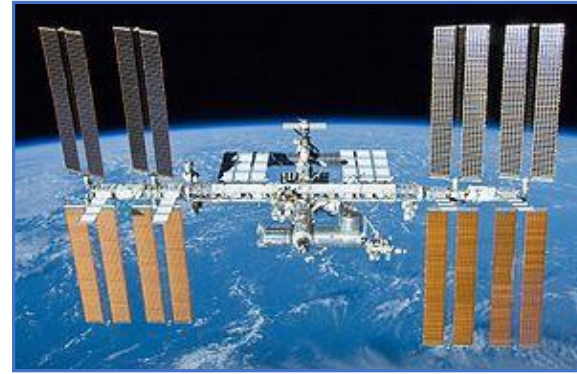


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Space Operations

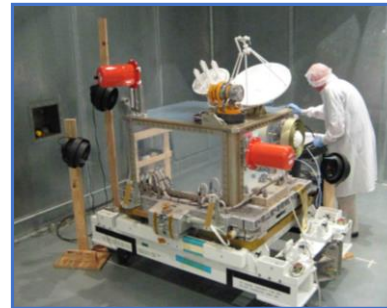
International Space Station (ISS)

- Develop and Operate ISS Microgravity Experiments
 - Fluid physics and combustion science research
- Human Research Program
 - Human health/exercise countermeasures
 - Exploration medical capability
 - Computational modeling
- ISS Electrical Power System
 - Sustaining engineering and analysis
 - Lithium-ion battery development/deployment



Space Communications and Navigation (SCaN)

- Advanced Communications Technology
 - Cognitive communications
 - RF propagation
 - RF/Optical hybrid technology
 - Beaconless pointing
 - Quantum communication and encryption
- Spectrum Management and Spectrum Analysis



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The Next Generation of Explorers

GRC Engagement Portfolio

- **Space Grant**
 - **GRC Specialist** – M. David Kankam
- **Minority University Research and Educational Project (MUREP)**
 - MUREP Aerospace Academy – Priscilla Mobley
 - **MUREP Institutional Research Opportunity (MIRO)** – M. David Kankam
- **NextGen STEM** – Maria Arredondo
- **NASA Internship and Fellowships (Students)**
 - Internships – Vanessa Webbs
 - **Fellowships** – M. David Kankam
- **NASA Postdoctoral Fellowship** – M. David Kankam
- **NASA Glenn Faculty Fellowship** – M. David Kankam
- **Educator Professional Development Collaborative (EPDC)** – Susan Kohler

Public Outreach

- **University Student Design Challenge (USDC-4)**
 - Register at: <https://www.nasa.gov/content/university-student-design-challenge-2019-2020>
 - Opens - , Closes – **10/18/'19**
 - **Aeronautics Projects:**
 - ❖ Hierarchical Control of Propulsion, Power, and Thermal Management for Electrified Aircraft Propulsion System
 - ❖ Automatic Dependence Surveillance Broadcast (ADSB) for Situational Awareness of Autonomous Unmanned Aerial Vehicles (UAV's)
 - **Space Projects:**
 - ❖ Enabling the Next Generation of Space Travel
 - ❖ Exploring and Utilizing the Lava Tubes of the Moon
 - Kick-off -11/6/'19; Winners Announcement - 4/13/'20

Public Outreach

- **GRC-Academia Snr.-Yr. Capstone Collaboration**
 - Registration **closed** on Sept. 12/19
- **University Day – Internship Awareness** (Oct/Nov)
 - Opportunity to increase- (a) Students' awareness of GRC facilities & hosted Internships
(b) Minority applicant pool through knowledge sharing
- **NASA Glenn Faculty Fellowship Program (NGFFP)**
 - Application for 2020 Enrolment -
https://www.nasa.gov/sites/default/files/atoms/files/ngffp_2020_application.pdf
 - Opened – Aug. 12/19; **Closes – Oct. 18/19** at 11:59 PM
- **NASA Postdoctoral Program (NPP)** - <https://npp.usra.edu>
 - Application Acceptance: July 2 - Nov. 1; Next Cycle: Nov. 2 - Mar. 1

GRC: Spring 2020 Internship Opportunities for Students

Opportunity	Areas of Expertise
Condensing Heat Exchanger for Space Systems - Lab Work Internship	6
Converting Applets to Javascript for Web-based Simulations in Aeronautics	6
Development and Evaluation of Electrified Aircraft Propulsion Control Systems	1,4
Synthesis and Characterization Ceramic Aerogels and their Composites	5
Materials Development for High Temperature Environments	1, 5
Metallurgical Laboratory Assistant	1, 4, 5
Office of STEM Engagement (OSTEM) Customer Service Intern	Center Operations
Photovoltaic Device Testing for Space and Lunar Surface Missions	4
Polymer Aerogels for Energy Absorption, Filtration, and Acoustic Impedance	5

- | | |
|---|---|
| 1. Aircraft Propulsion | 4. Power, Energy Storage, and Conversion |
| 2. Communications Technology and Development | 5. Materials and Structures for Extreme Environments |
| 3. Space Propulsion and Cryogenic Fluids Management | 6. Physical Sciences and Biomedical Technologies in Space |

GRC: Spring 2020 Internship Opportunities for Students - contd

Opportunity	Areas of Expertise
Polymer Aerogels for Energy Absorption, Filtration, and Acoustic Impedance	5
Power for Interstellar Fly-By Mission	4
Propellant Gauging Algorithms and Analysis	3
Reduced Gravity Cryogenic Transfer Project	3
Robotic Arm Antenna Near Field Scanning System	2
Shape Memory Material Database- Data extraction for the "Alloys" category	5
Superconducting Coil Testing and Modeling for Future Electric Aircraft	1, 3, 4
Ultra Sound Measurement Techniques for Turbomachinery Applications	1

- | | |
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Contact Information

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Useful Links

- **GRC Website:**

- <https://www.nasa.gov/centers/glenn/home/index.html>

- **NASA GRC Office of Education**

- <https://www.nasa.gov/centers/glenn/education/index.html>

Questions?

