Office of the Chief Engineer Overview

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April 15, 2014

OCE Mission

- Advise Agency leadership on the technical and programmatic readiness of NASA programs and projects
- Execute Agency's Engineering Technical Authority
- Provide "value added" independent assessment across all of NASA's program
- Steward Agency-level policy and standards for engineering and program and project management
- Share program/project management and engineering best practices, and lessons learned
- Support the workforce with training and knowledge management services needed to continuously improve program/project management and engineering skills

OCE Mission

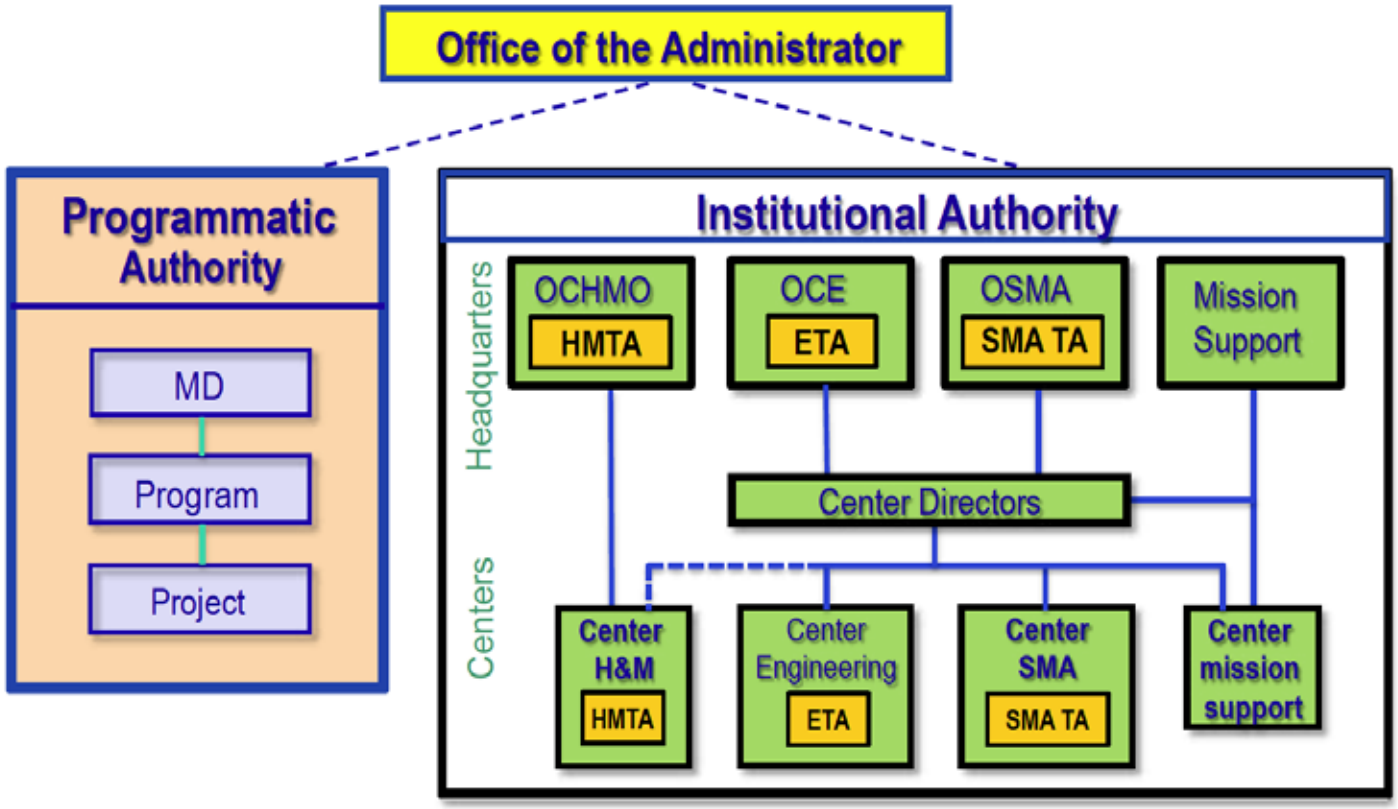
- **Advise Agency leadership on the technical readiness of NASA programs and projects**
  - Maintain awareness of all technical and programmatic issues and participate in major milestone reviews
  - Work with agency wide engineering community to mitigate the Agency's top technical risks

1) Gaining adequate insight into CCP partner designs to enable their success and certify vehicles for human spaceflight.
2) Technical integration of the 3 ESD human spaceflight programs utilizing a new model, led from HQ with limited resources.
3) Sustaining and maintaining ISS through 2024, dealing with hardware/software failures, MMOD risks, and human factors risks for flight and ground operations while conducting experiments and utilizing the ISS as a test bed.
4) The number and complexity of JWST mechanisms and deployments required for mission success.
5) Achieving closure of the MPCV/SLS/GSDO designs.
6) Cross cutting supply chain issues and a shrinking Industrial base.
7) Lack of hands on opportunities to train the next generation of engineers and leaders. This issue is exacerbated by an aging workforce and smaller pool of young engineers/scientists.
8) Inflexible accounting system driving inefficient use of agency-wide engineering skills, facilities and other resources resulting in less than "our best" technical solutions.
9) Constrained budgets driving insular behavior counter to our successful model of strong checks and balance and collaboration.
10) Constrained budgets driving reduced testing and a heavy reliance on models and analysis with limited anchoring to ground or flight tests.
11) Loss of skills for ground and dynamic flight operations for human spaceflight.
12) Gaining acceptance of 21st Century technology, tools and methods to successfully incorporate into our programs and projects

OCE Mission

- **Execute Agency's Engineering Technical Authority**
  - Delegate Engineering Technical Authority through the Center Directors down to the Engineering Directors and their Chief Engineers
    - Drive delegation to lowest level, closest to implementation
    - Disagreements are raised to next level for resolution
  - Chair the Engineering Management Board, whose membership includes the Engineering Directors from all 10 Centers
    - Develop agency wide engineering positions on issues
    - Address the agency's top technical risks
    - Agency wide engineering communication

Technical Authority



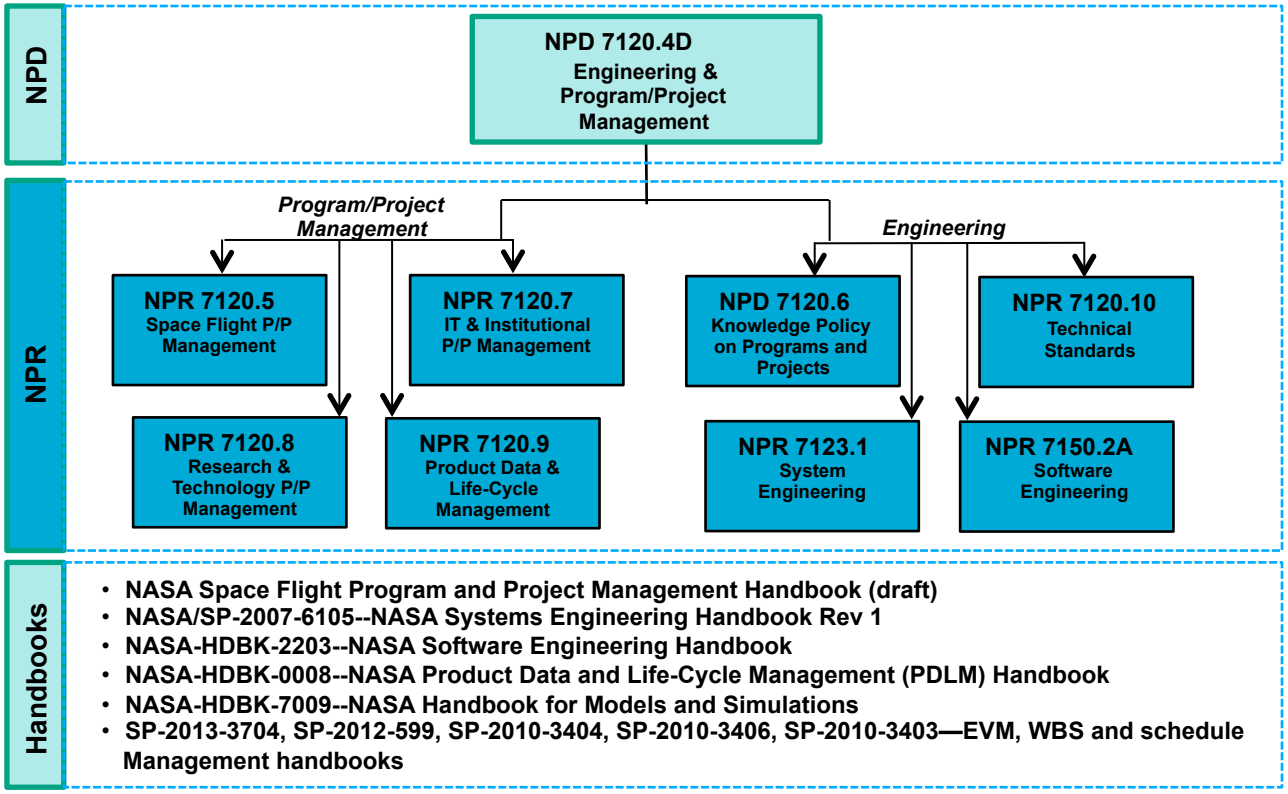
TA - Technical Authority
OSMA – Office of Safety and Mission Assurance
OCE – Office of the Chief Engineer
OCHMO – Office of the Chief Health and Medical Officer

OCE Mission

- **Provide "value added" independent assessment across all of NASA's program**
  - Formed the NASA Engineering and Safety Center following the Columbia tragedy to provide programs with a second perspective on difficult problems
  - Using a Tiger Team approach, partnering agency experts with industry and academia experts to provide an independent perspective
  - Successfully conducted over 500 Engineering and Safety Assessments in10 years across all of NASA Missions

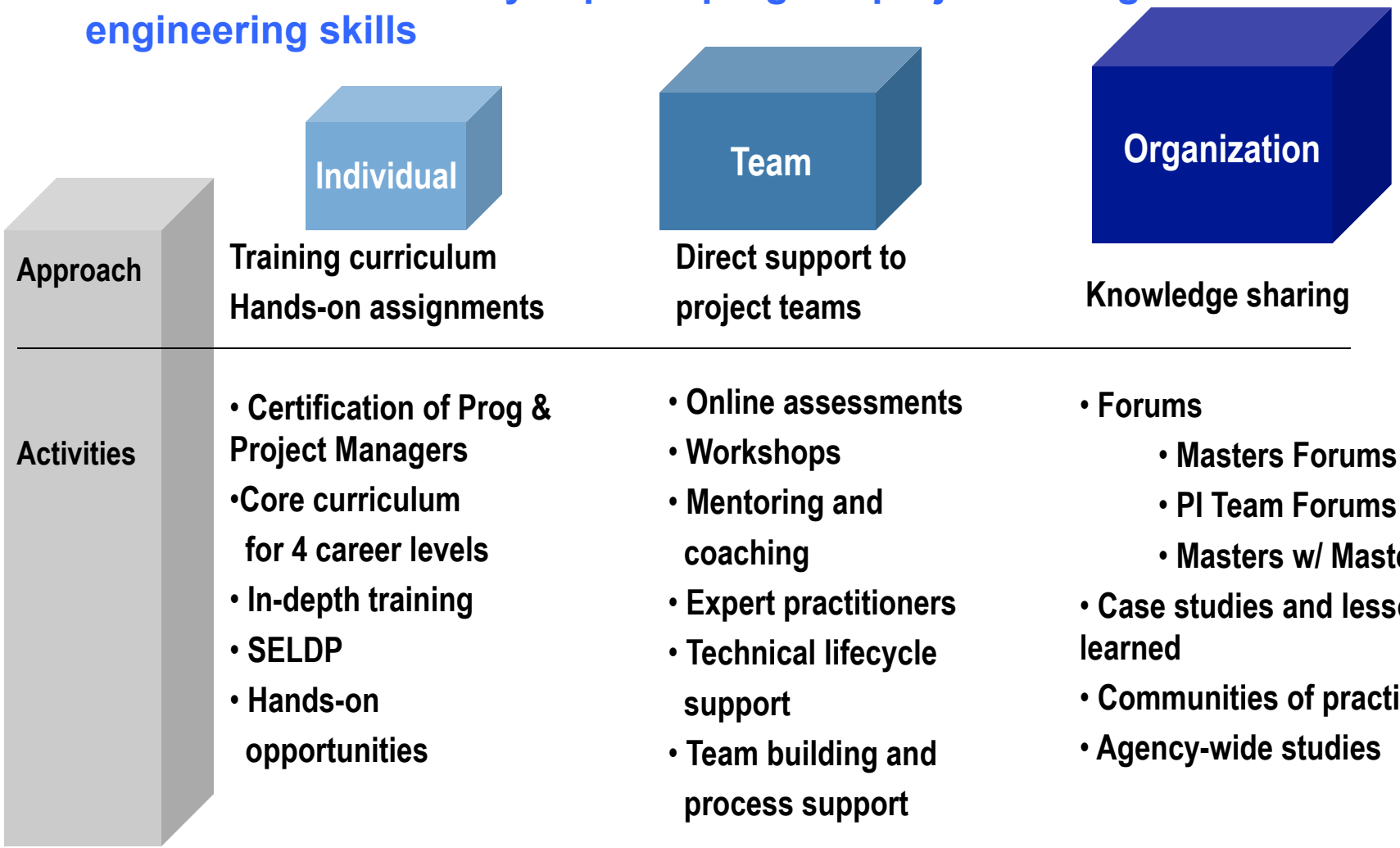
OCE Mission

- Steward Agency-level policy and standards for engineering and program and project management
- Share program/project management and engineering best practices, and lessons learned



OCE Mission

- **Support the workforce with training and knowledge management services needed to continuously improve program/project management and engineering skills**

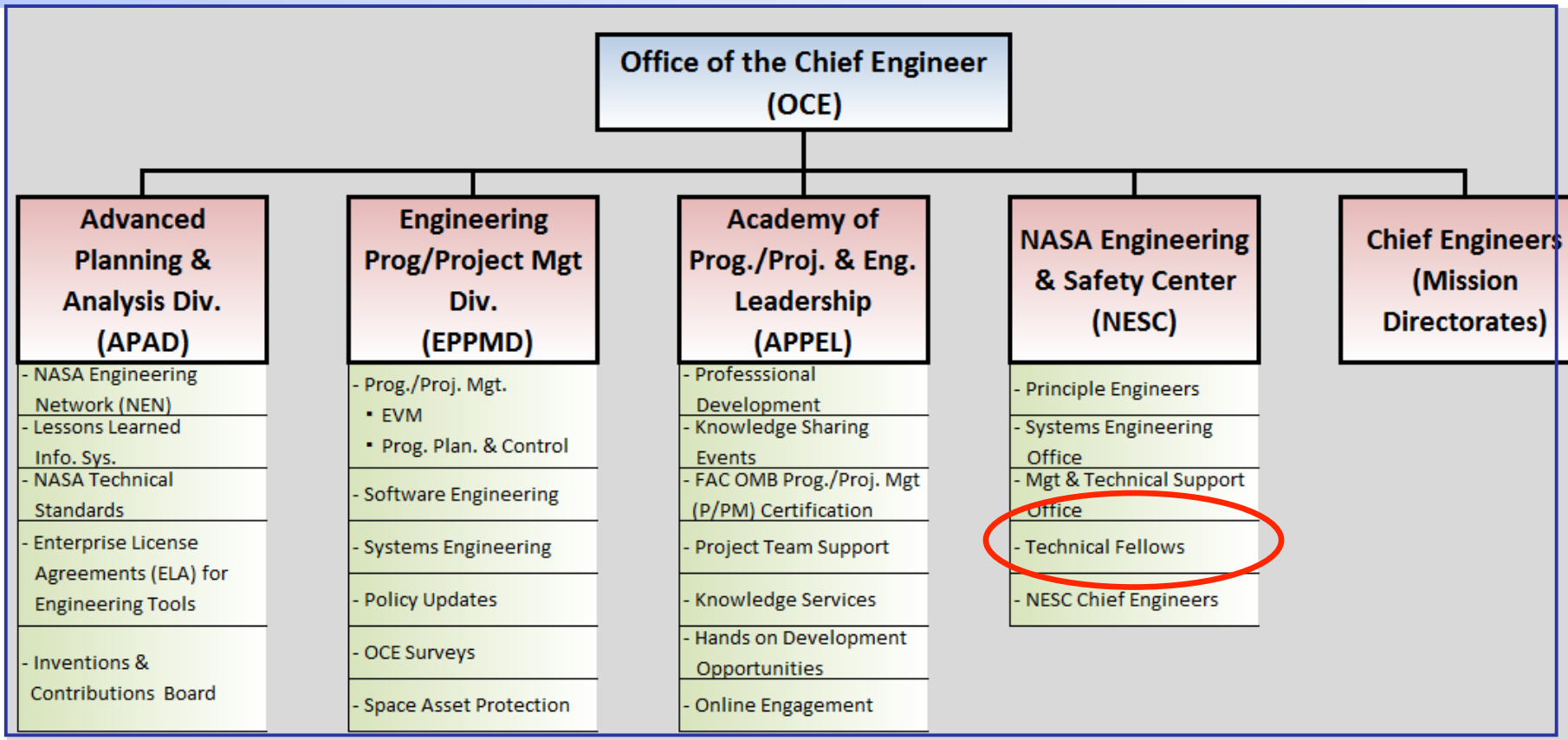


Summary

- The Office of the Chief Engineer is focused on the technical and programmatic readiness of the Agency's programs and projects
  - Executes Engineering Technical Authority
  - Provides "value added" independent assessment across all of NAS's missions
  - Maintains Program/Project Management Policy, Guidance and Engineering Standards
  - Shares best practices and Lessons Learned
  - Supports the workforce with training and knowledge services

Foundational Engineering Sciences Background

OCE


Office of the Chief Engineer (OCE)
Advanced Planning & Analysis Div. (APAD)
- NASA Engineering Network (NEN)
- Lessons Learned Info. Sys.
- NASA Technical Standards
- Enterprise License Agreements (ELA) for Engineering Tools
- Inventions & Contributions Board
Engineering Prog/Project Mgt Div. (EPPMD)
- Prog./Proj. Mgt.
▪ EVM
▪ Prog. Plan. & Control
- Software Engineering
- Systems Engineering
- Policy Updates
- OCE Surveys
- Space Asset Protection
Academy of Prog./Proj. & Eng. Leadership (APPEL)
- Professsional Development
- Knowledge Sharing Events
- FAC OMB Prog./Proj. Mgt (P/PM) Certification
- Project Team Support
- Knowledge Services
- Hands on Development Opportunities
- Online Engagement
NASA Engineering & Safety Center (NESC)
- Principle Engineers
- Systems Engineering Office
- Mgt & Technical Support Office
- Technical Fellows
- NESC Chief Engineers
Chief Engineers (Mission Directorates)

NASA Technical Fellows

Michael Aguilar
Software
GSFC

Neil Dennehy
GN&C
GSFC

Thomas Brown
Propulsion
MSFC

Oscar González
Avionics
GSFC

Chris Iannello
Power
KSC

Curtis Larsen
Loads & Dynamics
JSC

Daniel Murri
Flight Mechanics
LaRC

Cynthia Null
Human Factors
ARC

Joseph Pellicciotti
Mechanical
Systems
GSFC

Robert Piascik
Materials
LaRC

William Prosser
NDE
LaRC

Ivatury Raju
Structures
LaRC

Steven
Rickman
Passive
Thermal
JSC

Henry Rotter
Fluids, ECLS &
Active Thermal
JSC

David Schuster
Aerosciences
LaRC

NASA Technical Fellows

- ✓ Outstanding senior-level engineers and scientists with distinguished and sustained records of technical achievement
- ✓ Agency's leading experts in their respective technical disciplines
- ✓ Maintain NESC Technical Discipline Teams with ready-experts
- ✓ Provide leadership and act as role models for NASA discipline engineering communities beyond the Technical Discipline Teams
- ✓ Provide technical consistency across NASA through inputs to Agency-level specifications and standards and the tailoring of those standards for programs and projects
- ✓ Promote discipline stewardship through workshops, conferences and assorted discipline-advancing activities
- ✓ Ensure lessons learned are identified, widely shared across engineering organizations, and incorporated into Agency processes
- ✓ **Conduct discipline specific gap analyses to identify areas that require strategic investment to develop foundational engineering sciences**

NASA Technical Fellow Annual "State of the Discipline"

State of the NASA Aerosciences Discipline

Dr. David M. Schuster
NASA Technical Fellow for Aerosciences
NASA Engineering and Safety Center

May, 2013

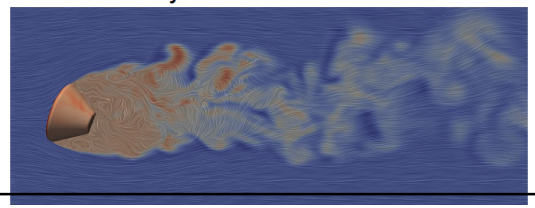
Top Aeroscience Challenges

Three aeroscience areas are currently hindering the prediction of environments and performance for flight vehicles. (In order of criticality)

1. **Aero-plume interaction prediction.**
   - Propulsion Plume Interactions.
   - Aero/RCS Interactions.
2. **Unsteady Separated Flows.**
   - Aeroacoustic and buffet environments.
   - CFD Algorithms and turbulence modeling.
3. **Aerothermal Predictions**
   - Ablator performance.
   - Boundary Layer Transition.
   - Unstructured Grid Aerothermodynamic Analysis.
   - Radiation Heating Prediction.

Unsteady Separated Flows

- **Collaborating with ARMD's Revolutionary Computational Aerosciences Project make them aware of the Aerosciences SoD challenges.**
  - Focus is on unsteady separated flow for a wide range of applications.
- **AIAA Aeroelastic Prediction Workshop leveraging U.S. and international partners and data.**
  - Initial focus is the prediction of unsteady, separated flow, eventually moving to structural coupling.
- **Orion wake characterization testing.**
- **SLS buffet CFD analysis.**



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Chief Engineer, Chief Scientist, Chief Technologist Vision for FES

- Utilize the existing programmatic portfolio within the Space Technology Mission Directorate (STMD) to manage these new investments
- Evaluate and prioritize the input from the Engineering, Technology and Science Communities
- Partner with Industry, Academia and other Government Agencies
- Select a portfolio of pilot projects and begin to invest in Foundational Engineering Sciences for our future