



NATIONAL INSTITUTE OF AEROSPACE

*Introduction to NIA*

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**Director, Research Program Development**

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# National Institute of Aerospace

- An Independent Non-profit Research and Graduate Education Institute formed in 2002 by a Consortium of Six Universities and the AIAA Foundation
- Conceived by NASA Langley Research Center and established to serve as LaRC's Collaborative Partner
- Conducts Collaborative **Research** in Engineering and Science relevant to Aerospace
- Offers Full- and Part-time Resident **Graduate Education** in Engineering and the Sciences from Member Universities
- Leads and Participates in a wide range of **Outreach** Programs to enhance the nation's Science and Technology Workforce





# Member Universities

Georgia Tech

Hampton University

North Carolina A&T State University

North Carolina State University

University of Maryland

University of Virginia

Virginia Tech

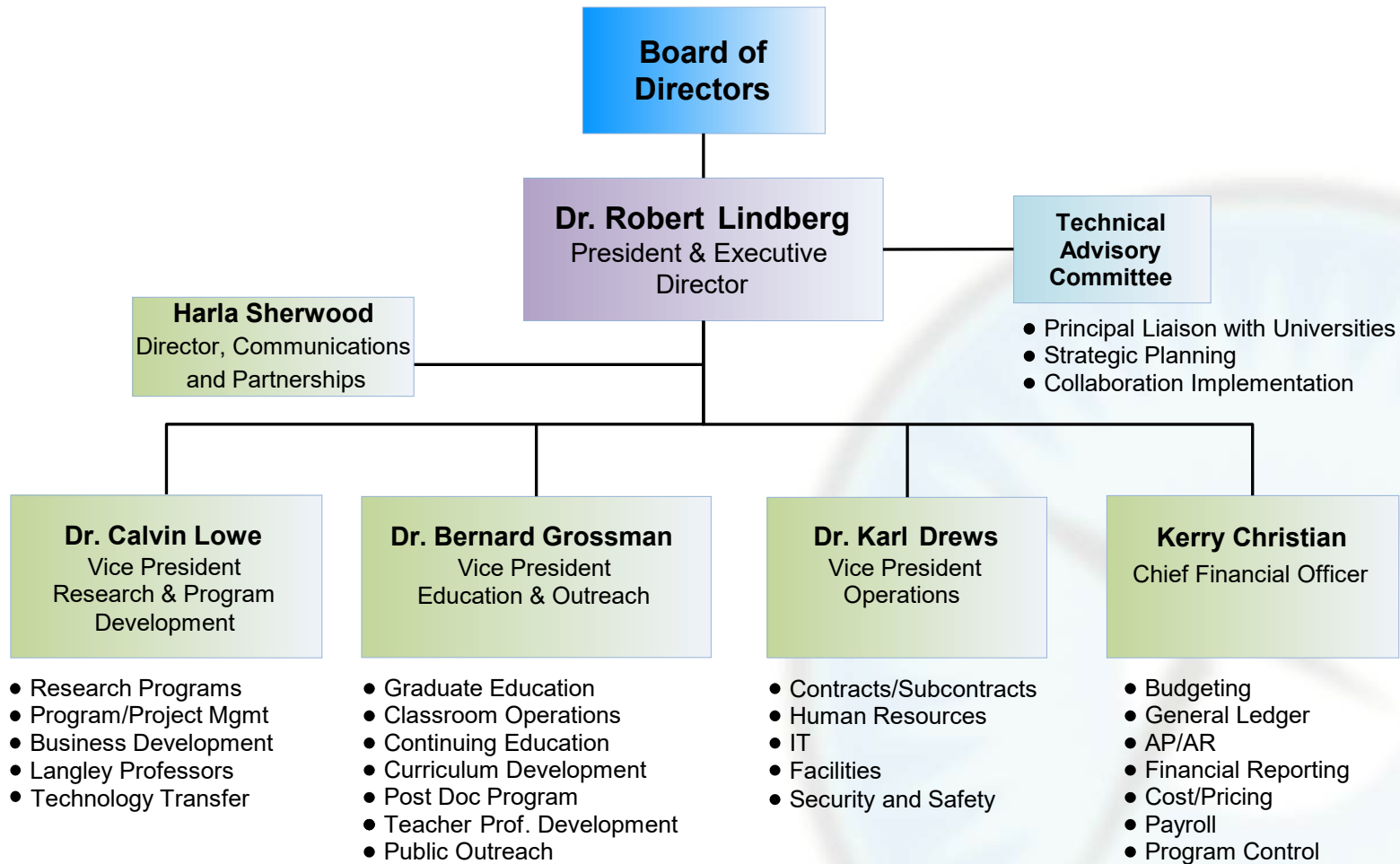
The College of William & Mary

Old Dominion University





# Organizational Structure





# Faculty-led Collaborative Research Centers



## Center for Planetary Atmospheric and Flight Sciences

- Director: Prof. Bob Tolson, North Carolina State University

## Center for Aerospace Acoustics

- Director: Prof. Chris Fuller, Virginia Tech



## Center for Adaptive Aerospace Vehicle Technology

- Director: Prof. James Hubbard, University of Maryland



## Center of Nanotechnology for Advanced Sensors, Actuators and Microsystems

- Director: Prof. Mool Gupta, University of Virginia



## Center for Aerospace Systems Analysis

- Director: Prof. Alan Wilhite, Georgia Tech



## Center for Exploration and Microsatellite Technology

- Director: Prof. William Edmonson,  
North Carolina A&T State University



## Center for Planetary Dynamics

- Director: Prof. Bill Moore, Hampton University



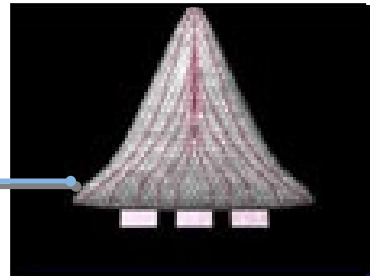


# Structures, Materials, Measurement Sciences

## Materials Synthesis & Processing



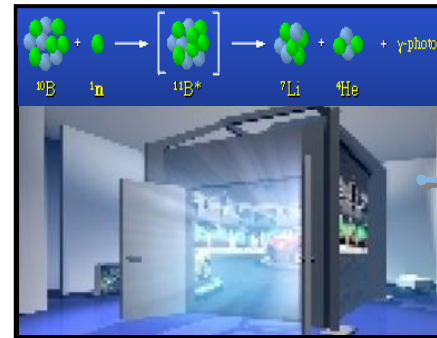
## Durability & Damage Tolerance



## Structural Health

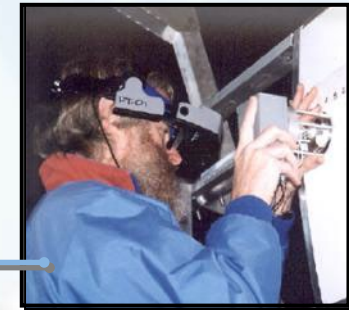


## Structural Concepts

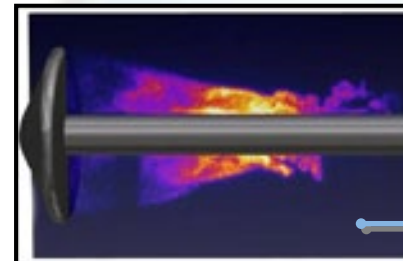


## Analytical & Computational Methods

## Nondestructive Evaluation



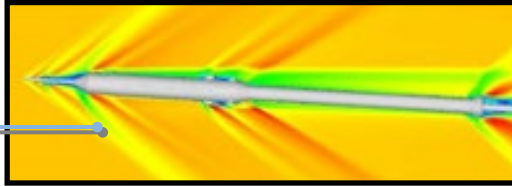
## Advanced Sensing & Optics





# Aerodynamics, Hypersonics, Acoustics

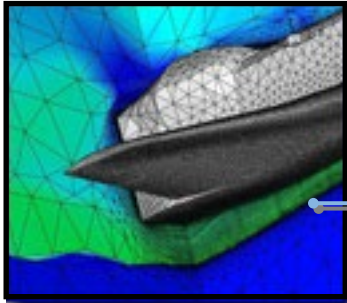
**Configuration  
Aerodynamics**



**Aeroelasticity &  
unsteady  
aerodynamics**



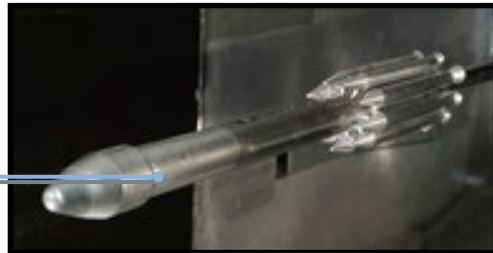
**Computational  
Aerosciences**



**Aerothermodynamics**



**Flow Physics &  
Control**



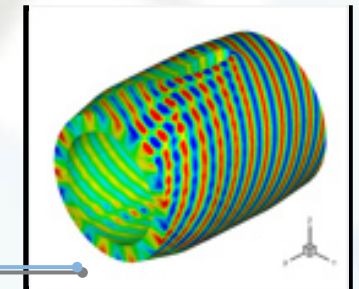
**Hypersonic  
Airbreathing  
Propulsion**



**Aeroacoustics**



**Structural Acoustics**





# Flight Dynamics, Aviation Safety and Airspace Operations

**Wake Vortex Modeling and Mitigation**



**Aircraft Flight Dynamics**



**Next Generation Air Traffic Management**



Requirements

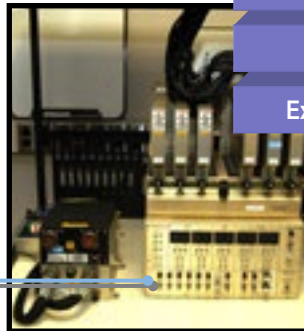
High-level design

Low-level design

Code

Executable

**Software Certification for Avionics systems**



**Entry Vehicle Control and Dynamics**



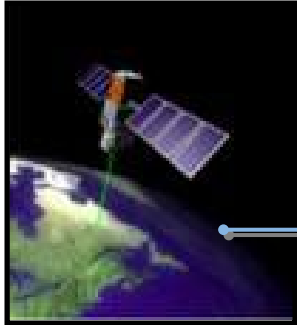
**Launch Vehicle Flight Dynamics**



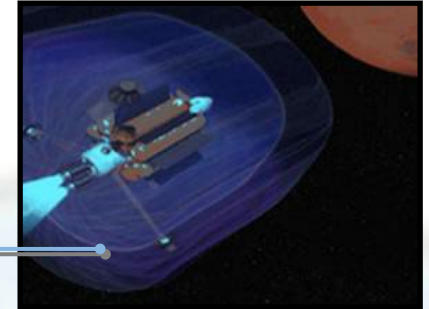




# Planetary Exploration, Atmospheric Sciences and Global Environmental Change

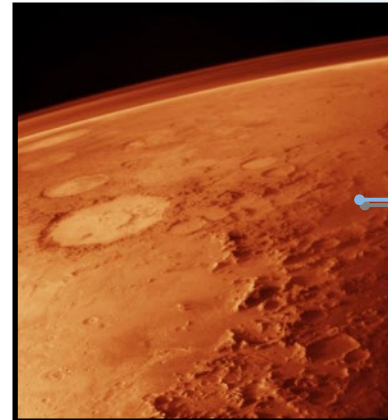
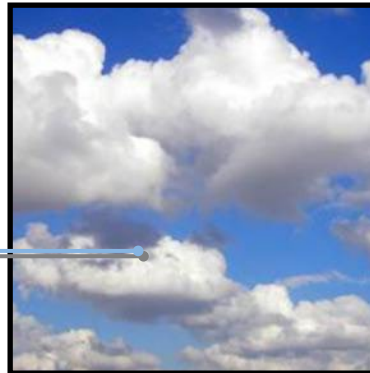


**Remote Sensing  
Systems**

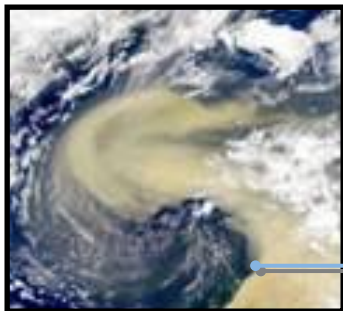


**Exploration  
Systems Analysis**

**Clouds and  
Aerosols**

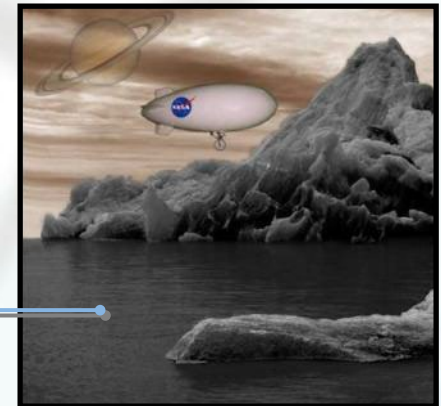


**Planetary Atmospheric  
Modeling**



**Atmospheric  
Modeling**

**Planetary  
Atmospheric Flight**





# NASA Langley has encouraged NIA to develop research support from other federal agencies

Nearly 35% of NIA's research, education and outreach programs are supported by other customers including NASA Headquarters, other NASA centers, other government agencies, industry and other educational institutions





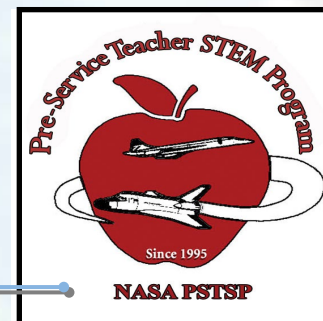
# Outreach at NIA

**Public Outreach Radio  
Supported by AIAA**



**NASA-Funded  
Educational Television**

**Teacher Professional Development  
Initiatives**



# NASA Technology Roadmaps Study

# NASA Technology Roadmaps

## NRC Study Organization

- **Study Chair: Dr. Raymond Colladay**
- **NRC Study Director: Mr. Alan Angleman**
- **Steering Committee**
- **Panels**
  - **Panel 1: Propulsion & Power**
  - **Panel 2: Robotics, Communications & Navigation**
  - **Panel 3: Instruments & Computer**
  - **Panel 4: Human Health & Surface Exploration**
  - **Panel 5: Materials**
  - **Panel 6: Entry, Descent & Landing**
- **NRC and Aerospace staff**

# STEERING COMMITTEE MEMBERS (1 of 2)

**DR. RAYMOND S. COLLADAY, CHAIR**, RC Space Enterprises, Inc.

**DR. IVETT A. LEYVA (P1)** Air Force Research Laboratory

**DR. PHILIP D. HATTIS (P2)** Draper Laboratory

**DR. GERALD SCHUBERT (NAS) (P3)** University of California,  
Los Angeles

**DR. TAMARA E. JERNIGAN (P4)** Lawrence Livermore National  
Laboratory

**DR. LISELOTTE “LISE” J. SCHIOLER (P5)** National Institute  
of Aerospace

**DR. JOHN D. ANDERSON, JR. (NAE) (P6)** National Air and  
Space Museum

**(Pn) = Steering Committee Liaison to Panel n**

## STEERING COMMITTEE MEMBERS (2 of 2)

**MAJ GEN JAMES B. ARMOR**, ATK, Spacecraft System & Services

**DR. EDWARD F. CRAWLEY (NAE)**, Massachusetts Institute of  
Technology

**DR. RAVI B. DEO**, Northrop Grumman Corporation (Ret.)

**MR. WALT FAULCONER**, Strategic Space Solutions, LLC.

**MR. JOHN C. KARAS**, Lockheed Martin Space Systems Co.

**DR. JOHN M. KLINEBERG**, Space Systems/Loral (Ret.)

**GEN LESTER L. LYLES**, The Lyles Group

**DR. H. JAY MELOSH (NAS)** Purdue University

**DR. DANIEL R. MULVILLE**, Mulville Consulting Services

**DR. DAVA J. NEWMAN**, Massachusetts Institute of Technology

**MAJ GEN RICHARD R. PAUL**, (Ret.) Consultant

# STATEMENT OF TASK FOR THE NRC

- Establish a set of criteria to prioritize technologies
- Conduct workshops for each roadmap to solicit public input
- Prepare a brief interim report that addresses high-level issues
- Panels meet individually to prioritize technologies and suggest improvements to the roadmaps
- Prepare a comprehensive final report that
  - Summarizes findings and recommendations for each of the 14 roadmaps
  - Integrates outputs from the workshops and panels to identify common threads and issues
  - Prioritizes, by group, the highest priority technologies from all 14 roadmaps



# Schedule

9/24/2010	Contract start date
10/25/2010	New study approach and Statement of Task agreed upon
1/10/2011	6 panels and steering committee appointed
1/25/2011	1 <sup>ST</sup> Meeting for Steering Committee and Panels (4 days)
3/9/2011	Workshops begin
5/11/2011	Workshops end
5/14/2011	2nd Panel Meetings (3 days) (date approximate)
5/18/2011	2nd Committee Meeting (3 days) (Draft interim report)
6/18/2011	Interim report to review
6/28/2011	3rd Panel Meetings (3 days)
8/1/2011	Panel reports due to Steering committee
8/9/2011	3rd Committee Meeting (3 days)
8/15/2011	Steering committee sends questions to the panels
8/27/2011	Interim report to NASA
8/29/2011	Panels respond to questions from the steering comm.
9/20/2011	4th Committee Meeting (3 days)
11/5/2011	Final Report to review
1/24/2011	Final Report to NASA

# Panel Tasks

## Provide improvements to the NASA roadmap by:

- Identify technology gaps
- Identify technologies not covered in roadmap
- Suggest changes to the development and schedule of technologies in each roadmap
- Provide a sense of value of the technologies (e.g., new science, reduced mass, new missions)
- Comment on the risk or reasonableness of the technologies
- Prioritize technologies in each roadmap
- Prepare written summary of the above

# EVALUATION CRITERIA

- **Benefits-** enhancements, game changing
- **Alignment with goals and objectives-**NASA, industry, nation
- **Technical risk and level of difficulty-**Risk, timing, effort
- **Descriptive factors:**
  - **Goals and Objectives**
  - **Technology Readiness Level**
  - **Tipping point**
  - **Alignment with NASA's expertise, capabilities, facilities and the nature of NASA's role in development of this technology**
  - **Would development of this technology substantially benefit from access to the space station?**

## Questions for subject experts

- What are the top technical challenges?
  - Provide technology gaps that the roadmap did not cover.
  - Identify high priority technology areas for NASA.
  - Alignment with the NASA's expertise, capabilities, facilities and role?
  - NASA's proposed technology develop. effort & competitive position.
  - Specific technology as a "Game Changing Technology"?
  - Any technology component near the tipping point (such that a relatively small additional effort could produce a large advance in technology readiness)?
  - Time horizon for technology to be ready for insertion (5-30 year)?
  - Provide a sense of value in terms of payoffs, risk, technical barriers and chance of success.
- The roadmaps are primarily focused on TRL 1-6 technologies.

- **Draft NASA Roadmaps available at:**  
<http://www.nasa.gov/offices/oct/home/roadmaps/index.html>
- **More details on the study available at:**  
<http://nationalacademies.org/NASARoadmaps> OR  
[http://sites.nationalacademies.org/DEPS/ASEB/DEPS\\_059552](http://sites.nationalacademies.org/DEPS/ASEB/DEPS_059552)
- **Submit comments on the roadmaps at:**  
<http://www8.nationalacademies.org/asebsurvey/tabs/>
- **View comments submitted by others at:**  
<http://www8.nationalacademies.org/asebsurvey/tabs/publicview.aspx>