

National Aeronautics and Space Administration



An Overview of NASA Ames Research Center

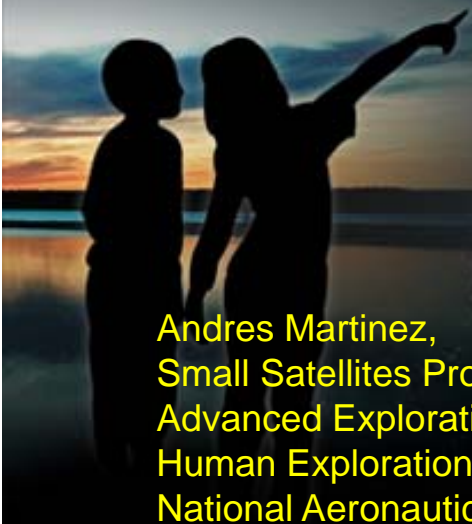
REACH
— NEW —
HEIGHTS

BENEFIT
— ALL —
HUMANKIND

Space Generation Advisory Council
South American Regional Space Generation Workshop 2016
1 - 2 August, 2016
Lima, Peru

REVEAL
— THE —
UNKNOWN

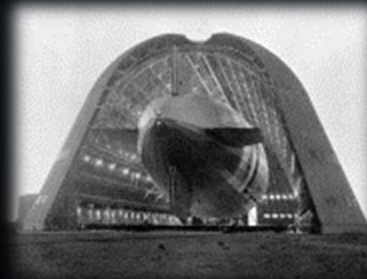
Andres Martinez,
Small Satellites Program Executive
Advanced Exploration Systems
Human Exploration and Operations Mission Directorate
National Aeronautics and Space Administration



Ames is One of the Early National Advisory Committee for Aeronautics Laboratories



Joseph S. Ames



NACA

NASA

Ames

Langley

Lewis

Dryden

1915

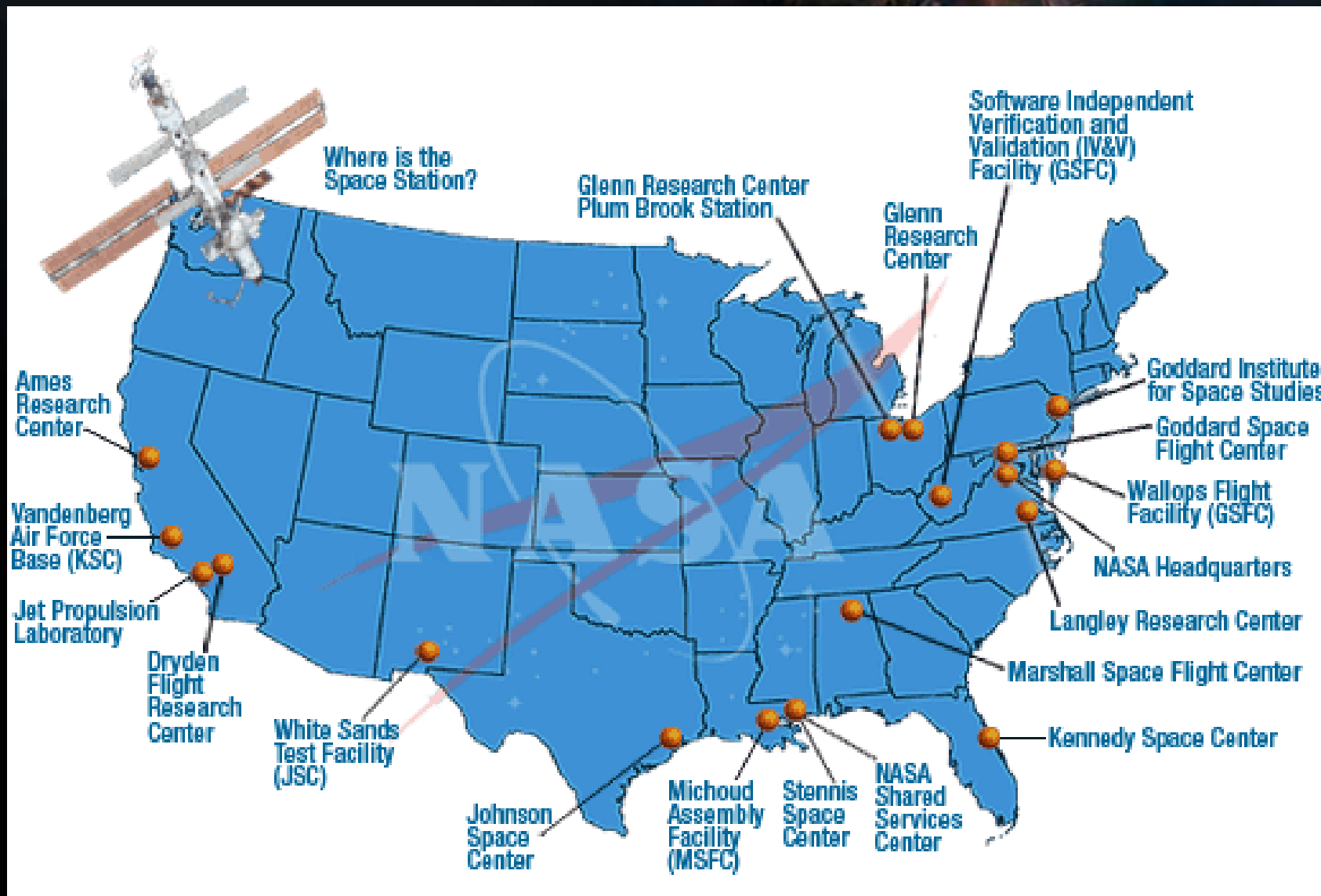
1939

1940

1946

1958

NASA Locations



Ames Research Center



- 2480 employees (50/50 FTE/WYE)*

- ≈\$900M+ annual revenue
(including reimbursable)

*in addition, ~900 students summer 2014

- Science
 - Space, Earth, Biological Sciences
 - Astrobiology, Lunar Science
- Exploration Systems
 - Exploration Technology Development
 - Thermal Protection Systems
 - Supercomputing
- Projects and Missions
- Aeronautics & Aviation
 - NextGen Airspace Systems
 - Fundamental Aeronautics
 - Aviation Safety
 - Green Aviation
- Affordable Small Satellites
- Innovation, Education, & Entrepreneurial Collaborations
 - NASA Research Park

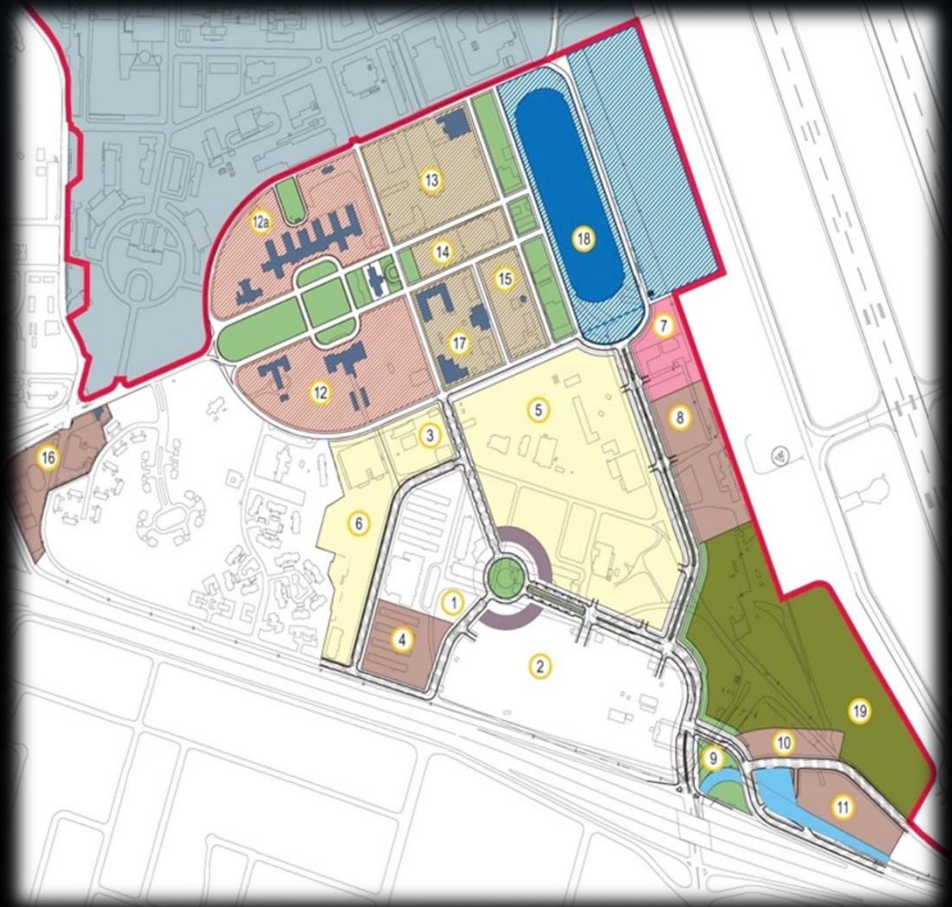
NASA Research Park



An established regional innovation cluster that facilitates commercialization by serving as a technology accelerator through vital and robust onsite collaborations.

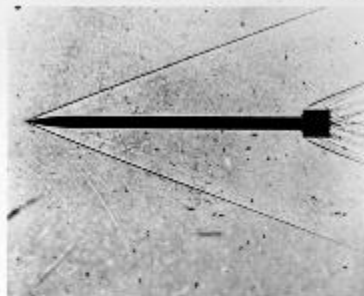
70+ Partners Today

- University Associates-Ground Lease
- PV "Google"-North East Section-Ground Lease
- M2MI Corporation-Bldg.19
- Carnegie Mellon University-Bldg. 23, 19
- Kentucky Science & Technology Corporation-Bldg.19
- Bloom Energy-Bldg. 543, 154 (Fuel Cell Research)
- UAV Collaborativer-Bldg.18
- Singularity Education Group-Bldg. 20
- BAER Institute-Bldg. 19
- Chandah Space Technologies-Bldg. 19
- Deep Space Industries-Bldg. 156
- IDM Technologies-Bldg. 19
- Logyx LLC-Bldg. 19
- Made in Space-Bldg. 153
- Neurovigil Inc.-Bldg. 19
- Rhombus Power-Bldg. 19
- Scanadu Inc.-Bldg. 20
- SkyTran-Bldg. 14
- Verdigris Technology-Bldg. 19
- ZeeAero-Bldg. 210
- LatIPnet-Bldg. 19
- Wyle Laboratories-Bldg. 19

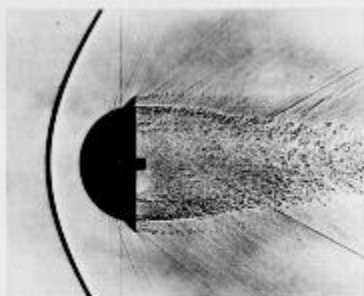




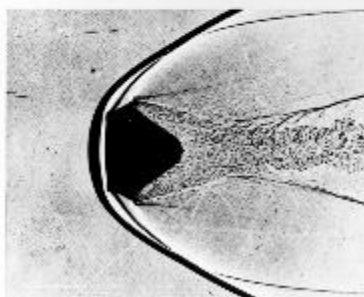
RESEARCH CONTRIBUTING TO PROJECT MERCURY



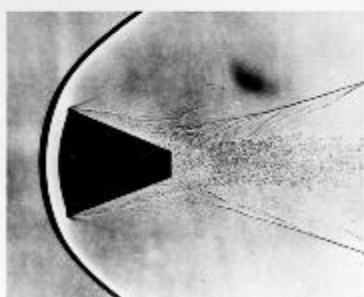
INITIAL CONCEPT



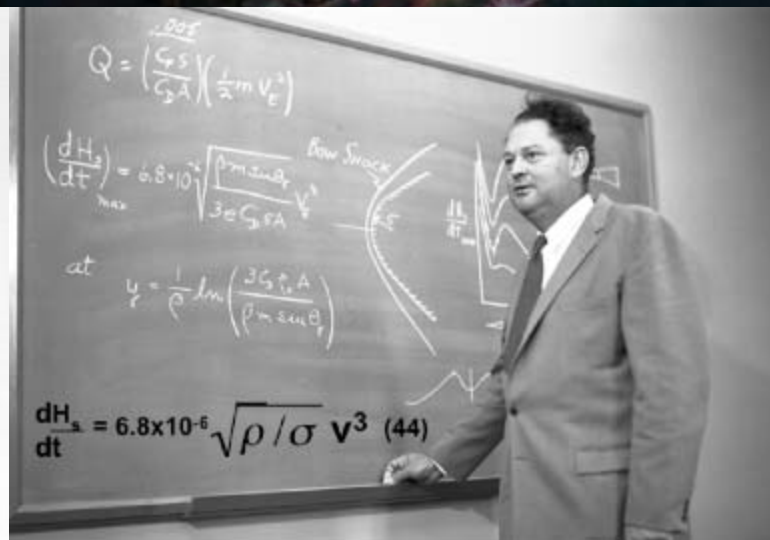
BLUNT BODY CONCEPT 1953



MISSILE NOSE CONES 1953-1957



MANNED CAPSULE CONCEPT 1957



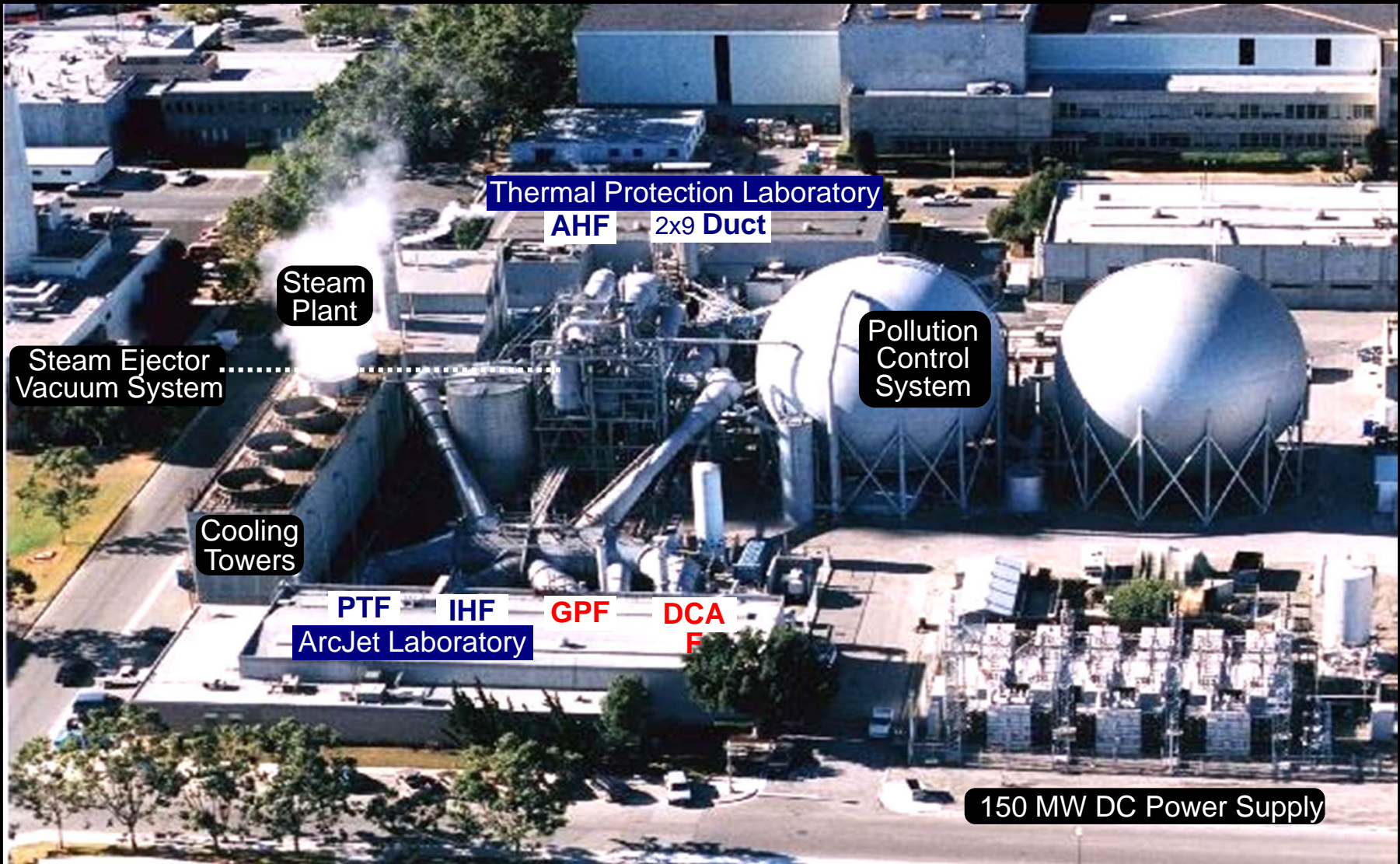
H. Julian Allen – “Blunt Body” concept of re-entry aerodynamics which permitted successful recovery of orbiting spacecraft.



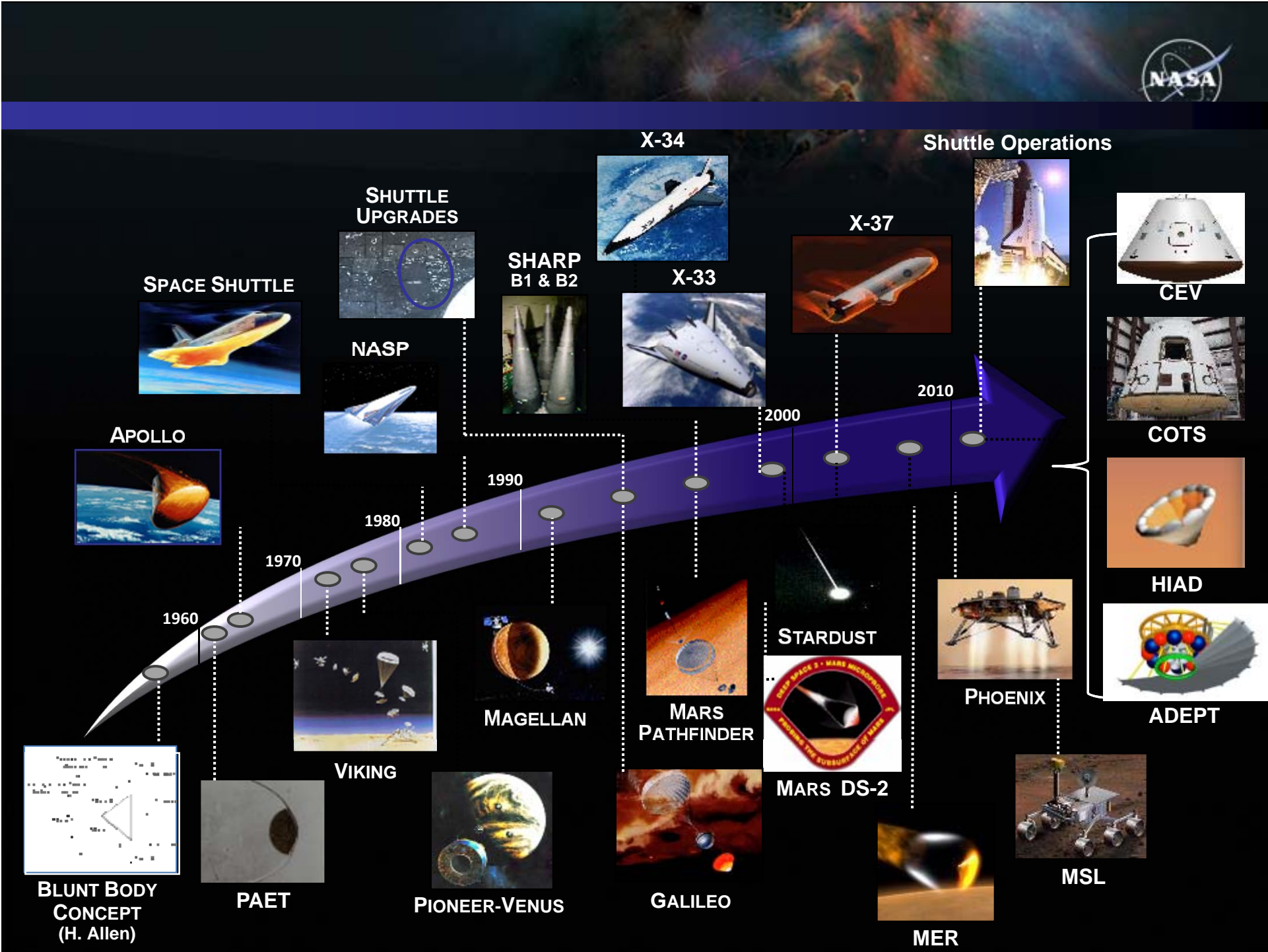
Dean Chapman - Pioneer in Aerothermodynamics



Planetary Entry Probe Innovator



KEY 2 x 9 Duct - Turbulent Flow Facility IHF - Interactive Heating Facility GPF - Giant Planet Facility
 AHF - Aerodynamic PTF - Panel Test Facility DCAF - Direct Connect Aerodynamic Facility



National Full-Scale Aerodynamics Complex



The 80- by 120-foot is an open circuit tunnel. Air is drawn from the huge 360-foot wide, 130-foot high air intake, passes through the 120-foot wide, 80-foot high test section and then is expelled to the atmosphere. The maximum airspeed through the test section is 115 mph. Power is derived from six 40-foot diameter fan blades, each motor rated at 23,500 hp.



The world's largest wind tunnel. The 80-by 120-foot tunnel is capable of testing aircraft as large as a Boeing 737.



From the dawn of powered flight, military and commercial aircraft have benefitted from NASA Ames Research Center aeronautics



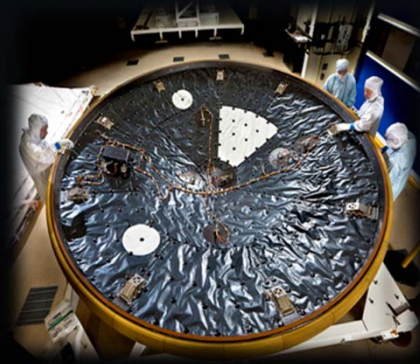
The model is one-third the size & weight of a full-scale orbiter.

F/A-18 aircraft, first full-scale aircraft to undergo tests in the world's largest wind tunnel.

Core Competencies



Air Traffic Management



Entry Systems



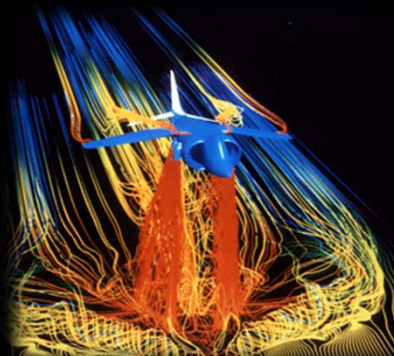
Advanced Computing
& IT Systems



Intelligent/ Adaptive
Systems



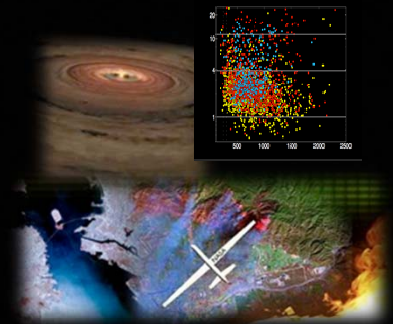
Low-Cost Space Missions



Aerosciences



Astrobiology and
Life Science



Space and Earth Sciences



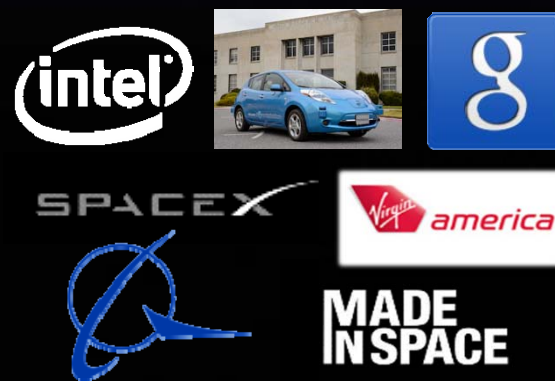
Partnerships at Ames

- Partnering with external organizations to access capabilities under collaborative agreements
- Entering into reimbursable agreements for partner access to NASA capabilities
- Expanding overall landscape of space activity (maximizing public and private sector growth)
- Spurring innovation

International



Commercial



Virtual

Institutes



Interagency



Military



NASA Research Park



Academia



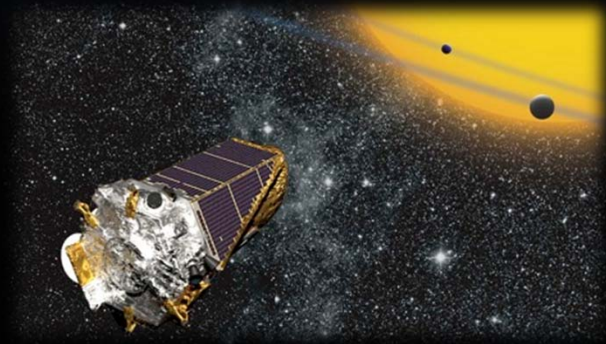
NASA Centers



Science @ Ames



The Ames Science Directorate employs 430 scientists, engineers and staff, including 150 civil servants, in pursuit of world-class research and missions in space science and astrobiology, Earth science and biological sciences.

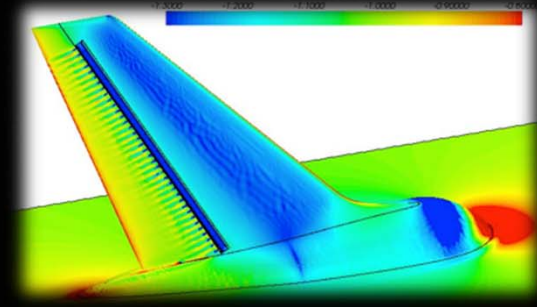
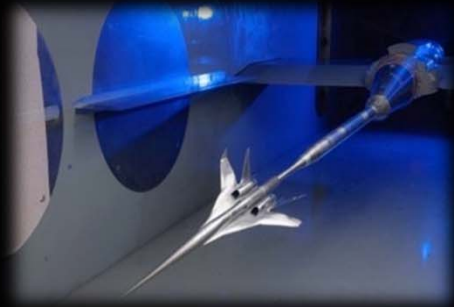


Aeronautics @ Ames



Primary Research Areas:

- Next Gen – Air Traffic Management
- Verification and Validation of Flight Critical Systems
- Data Mining and Human Machine Interface
- Rotorcraft Aeromechanics and Controls
- UAS Traffic Management and Operations
- Environmentally Responsible Aviation
- Large Scale Wind Tunnel Testing and Flow Visualization



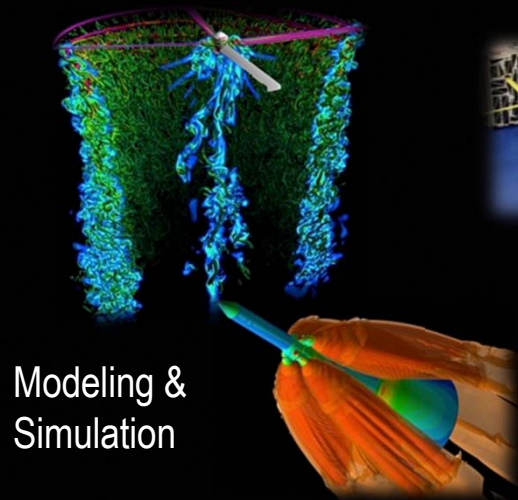
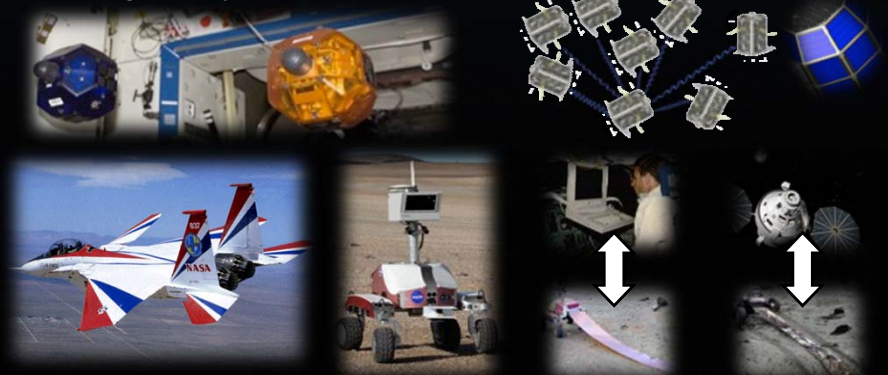
Exploration Technologies @ Ames



Our mission is to be world-class creators and facilitators of innovative, intelligent, high-performance and reliable exploration technologies that will enable current and future NASA missions.



Intelligent Systems



Modeling & Simulation



Small Spacecraft Technologies & Missions



Entry Systems

ENTRY
thermal-structural loads based on mass, shape and trajectory

LAUNCH
mass & size limits
vibro-acoustic loads

ORBIT
MMOD
radiation

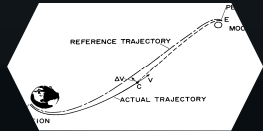
LANDING

atomic oxygen
thermal-structural loads
structural loads based on impact

75 Years of Innovation



Tektites



Apollo Guidance System



X-36



Lunar Prospector



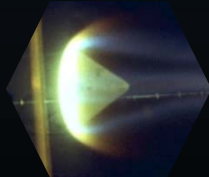
SOFIA



Flight Simulator



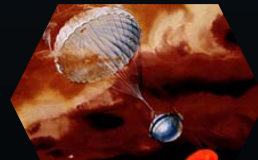
Blunt Body Concept



Apollo Heat Shield Tests



Pioneer 10/11



Galileo



Space Biology

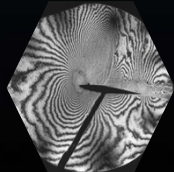


SSERVI

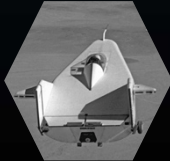
2015



Kepler



Transonic Flow



Lifting Body



Pioneer Venus



Viking

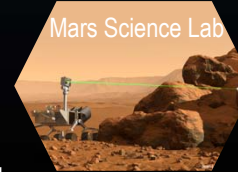


Human Centered Computing

1980

1990

2000



Mars Science Lab



Sustainability Base



Swept-Back/Wing



Flight Research

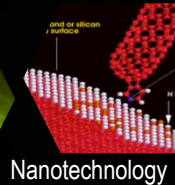


Life Sciences Research

1970



Air Transportation System



Nanotechnology



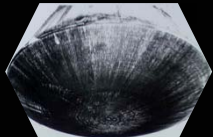
NASA Research Park



IRIS



Aero Institute



Apollo Re-Entry Shape

1960



CFD



Tiltrotor



ER-2



ISS



LCROSS

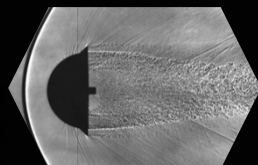


Conical Camber



Arcjet Research

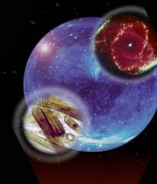
1940



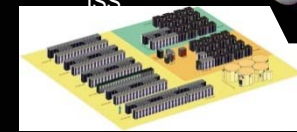
Hypervelocity Free Flight



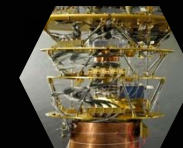
80x120 Wind Tunnel



Astrobiology Institute



Pleiades



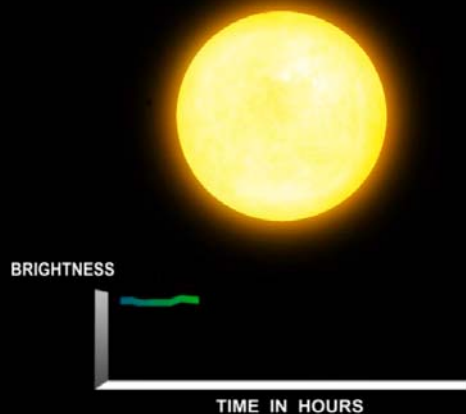
Quantum Computing



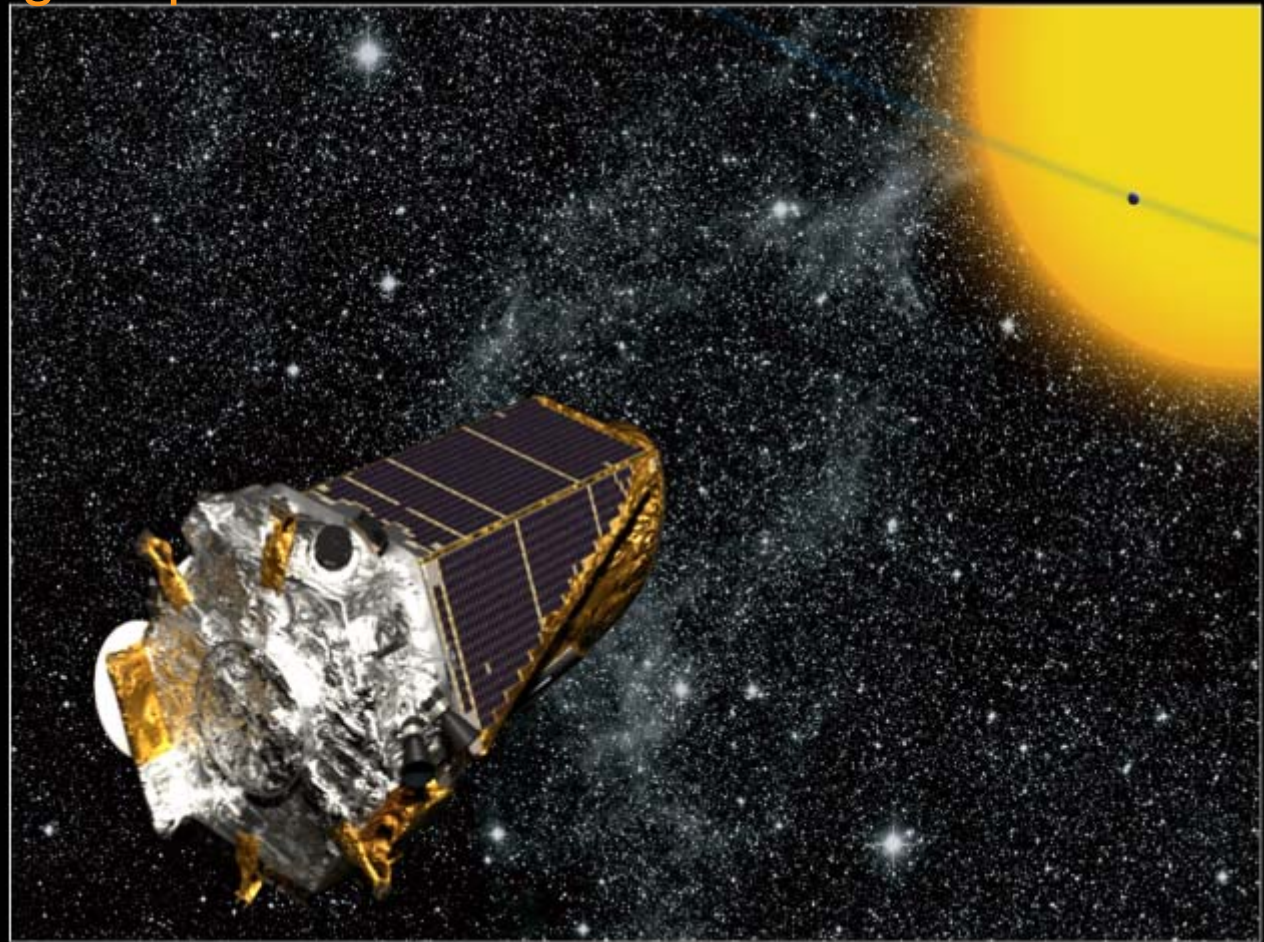
LADEE

NASA's Kepler Mission:

Searching for planets around other stars



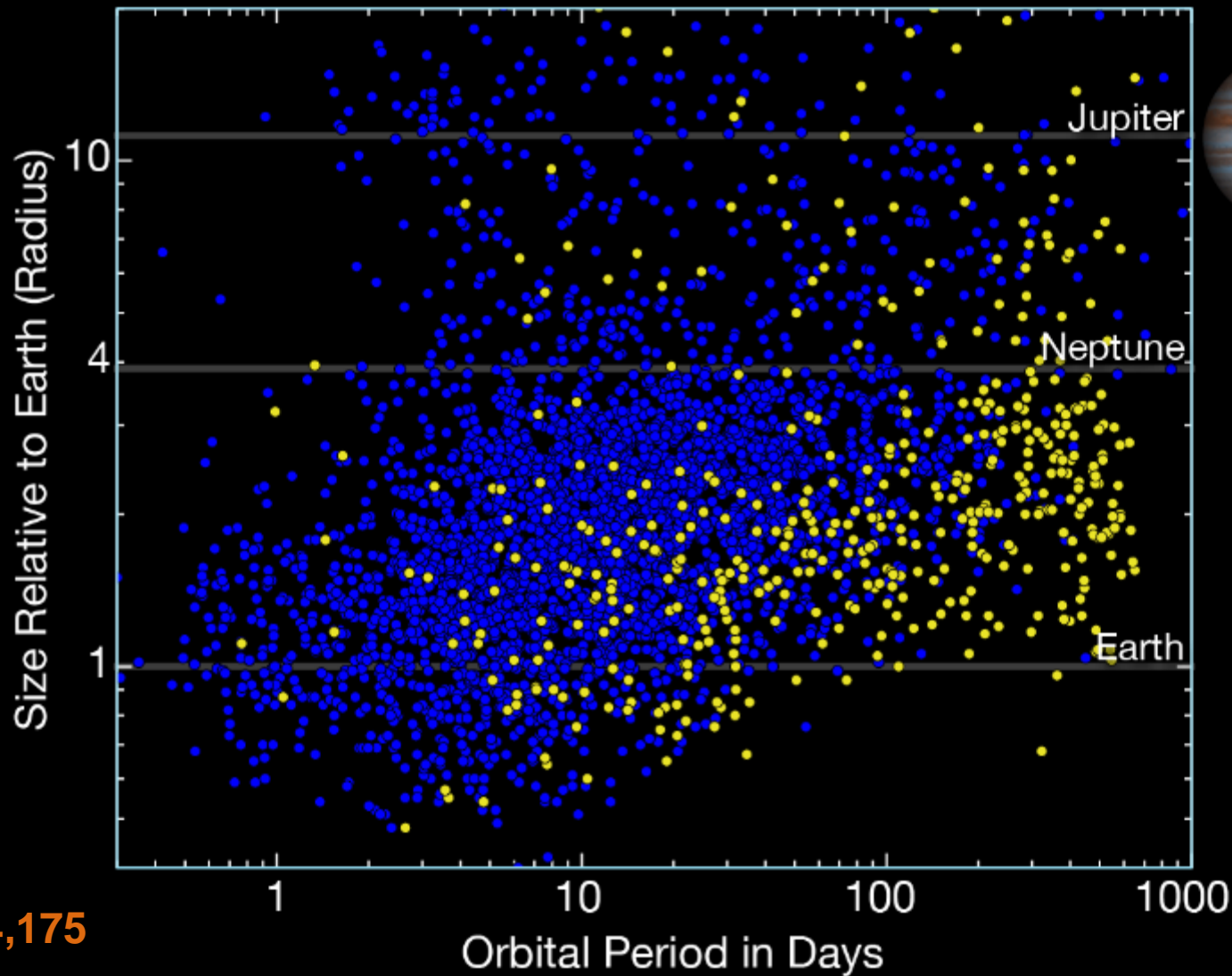
Planets are detected when the orientation of the orbit causes the planet to transit the disk of the star, temporarily blocking out a small portion of the light.



Launched 2009, purpose to determine the frequency and diversity of planets in our Galaxy. Kepler is a survey mission that looked at more than 160,000 stars, simultaneously measuring the brightness of each star every 30 minutes.

4,175 New Planet Candidates

As of January 2015



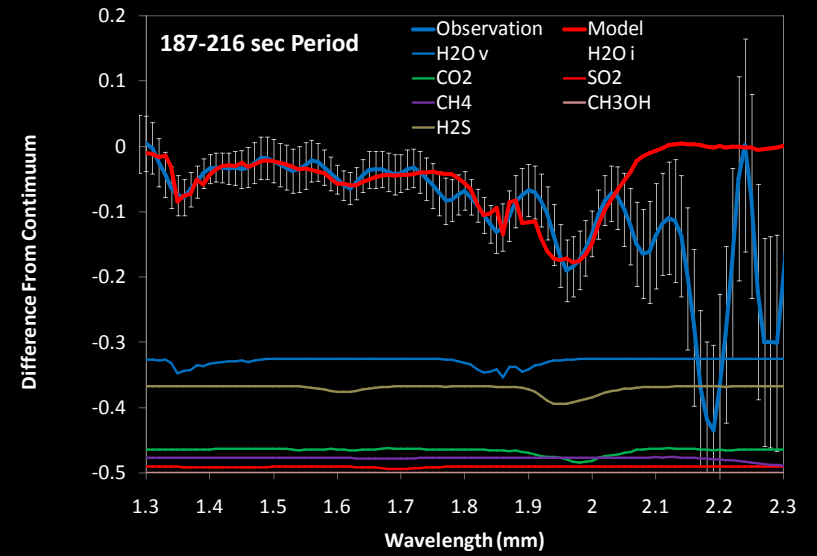
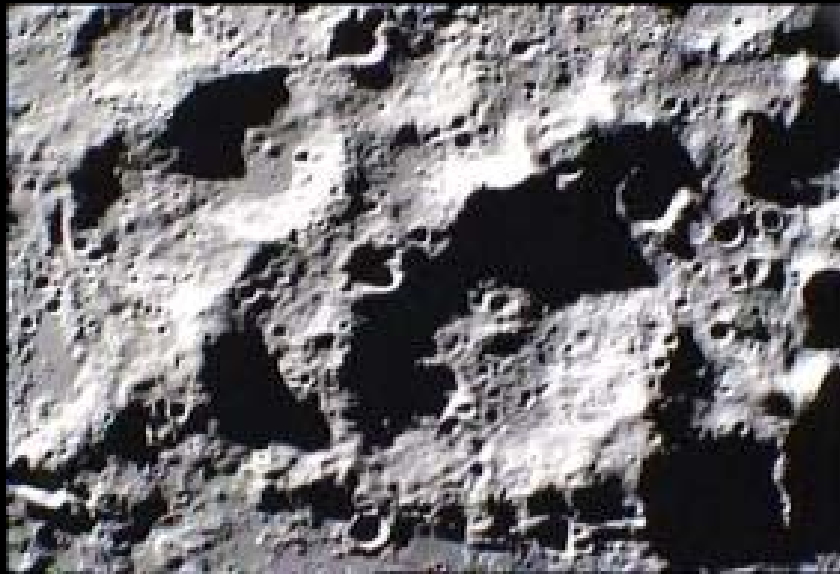
Total = 4,175

Lunar Crater Observation and Sensing Satellite (LCROSS) Lunar Impactor - 2009

–The Lunar Crater Observation and Sensing Satellite was a robotic spacecraft operated by NASA. The mission was conceived as a low-cost means of determining the nature of hydrogen detected at the polar regions of the moon.

–**Result:** Found Water on the Moon, and changed our understanding of Volatiles on the lunar surface.







Lunar Atmosphere and Dust Environment Explorer (LADEE) Lunar Orbiter

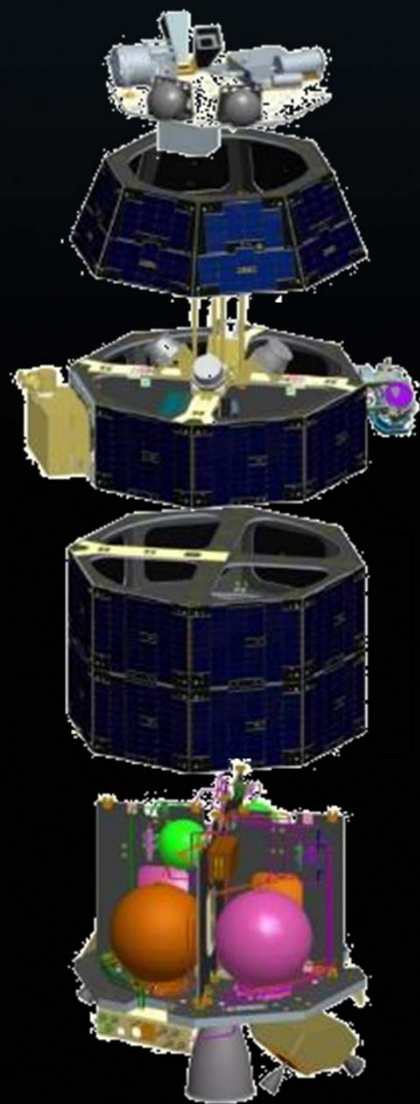
A robotic mission that orbited the moon and gathered detailed information about the lunar atmosphere, conditions near the surface and environmental influences on lunar dust.

A thorough understanding of these characteristics are now being used to address long-standing unknowns to help scientists understand other planetary bodies as well.





LADEE Lunar Orbiter



Radiator Assembly

Bus Module

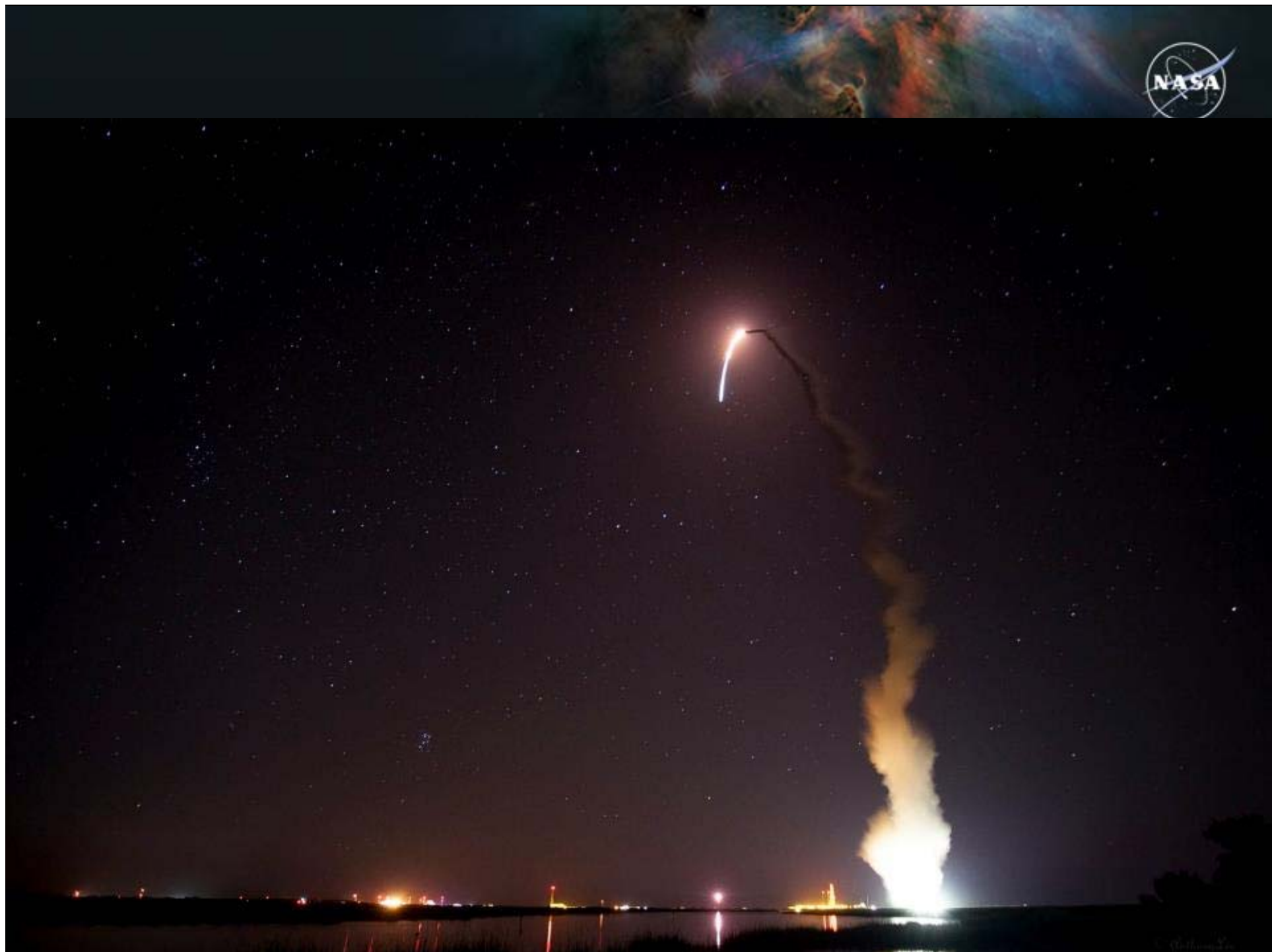
Payload Module

Extension Modules

Propulsion Module



Launch: September 2013 - Minotaur V
Launch Site: NASA's Wallops Flight Facility





Ben Cooper / LaunchPhotography.com

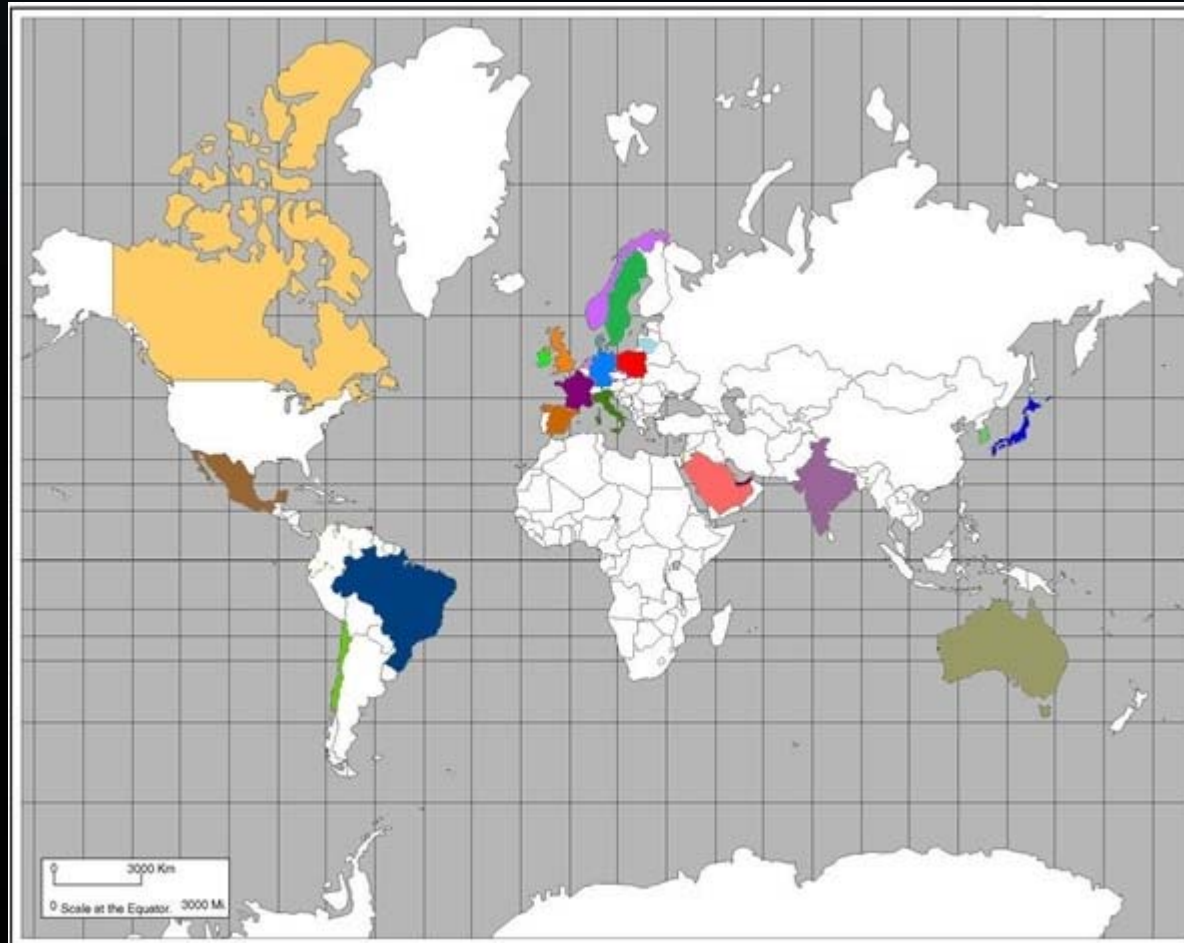


International Partnerships



Interns/ Visiting Researchers

1. Australia
2. Brazil
3. Denmark
4. France
5. Japan
6. India
7. Ireland
8. Israel
9. Italy
10. Mexico
11. Norway
12. Poland
13. Spain
14. S. Korea
15. UAE
16. UK



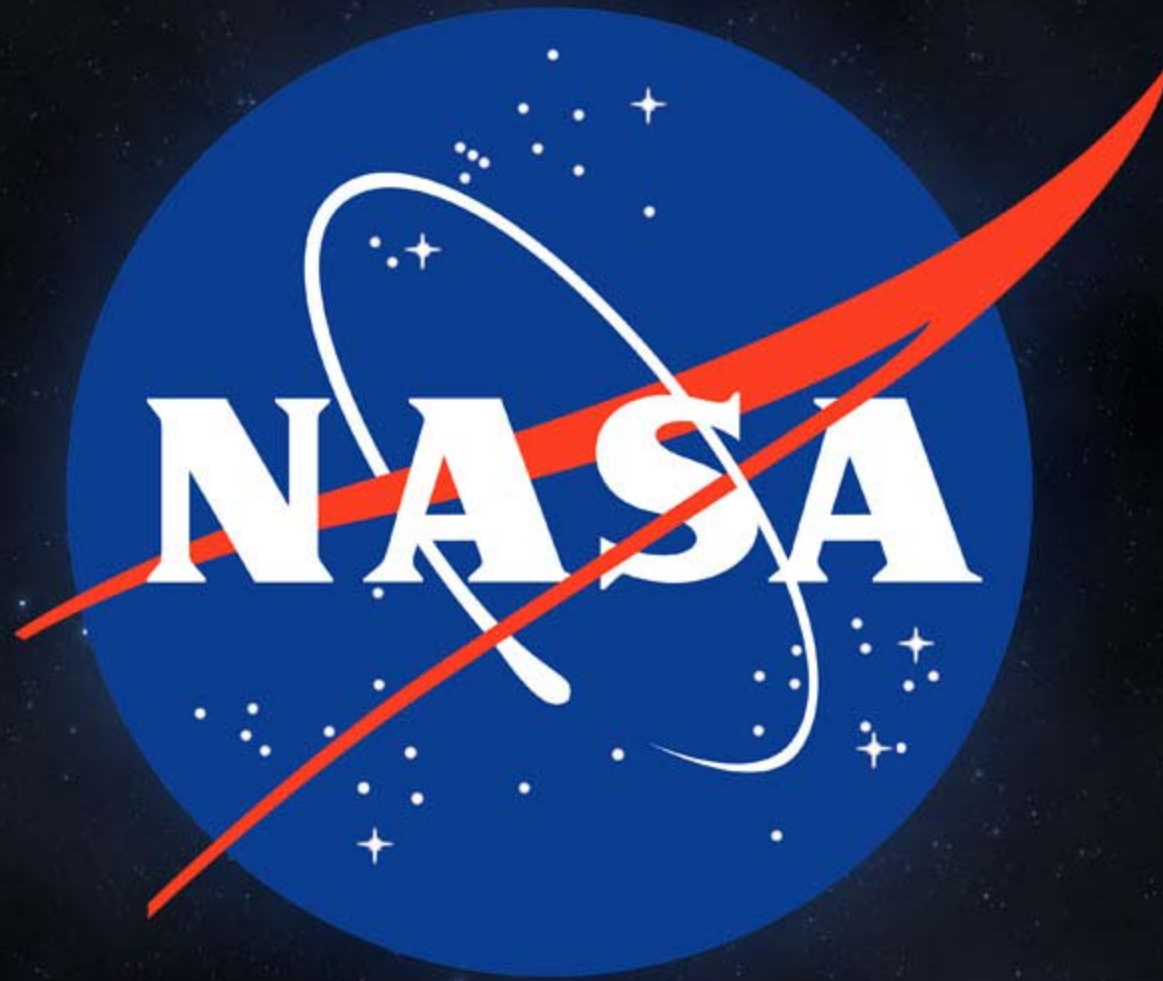
Technical Collaboration

1. Canada
2. Chile
3. France
4. Germany
5. Italy
6. Japan
7. Lithuania
8. **Mexico**
9. Netherlands
10. Norway
11. Saudi Arabia
12. Sweden
13. Spain
14. Trinidad & Tobago
15. UK



QUESTIONS?





<http://www.nasa.gov/smallsats>

<http://www.nasa.gov/spheres>

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