An Overview of NASA Ames Research Center

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

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

NACA

1915

Joseph S. Ames

Langley

Ames

NASA

1939 1940 1946 1958

Dryden
NASA Locations

Map showing locations of NASA centers across the United States.
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
M2Ml 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
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
2 x 9 Duct - Turbulent Flow Facility
AHF - Aerodynamic Heating Facility
IHF - Interactive Heating Facility
PTF - Panel Test Facility
GPF - Giant Planet Facility
DCAF - Direct Connect Aerodynamic Facility

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Steam Plant
Steam Ejector
Vacuum System
Cooling Towers
Thermal Protection Laboratory
Pollution Control System
150 MW DC Power Supply
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.

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

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

- NASA
- International institutes
- Military

**Commercial**

- NASA Research Park
- Academia
- Aerospace and technology companies

**Virtual Institutes**

- NAI: the Community
- Virtual institutes

**Interagency**

- SERI
- GSI
- NASA Centers
- Interagency partnerships
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.
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
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.
75 Years of Innovation

- 1940: Conical Camber
- 1950: Blunt Body Concept
- 1960: Flight Simulator
- 1970: Lifting Body
- 1980: Transonic Flow
- 1990: Swept-Back/Wing
- 2000: Apollo Guidance System
- 2015: Apollo Heat Shield Tests

- 1940: X-36
- 1950: Pioneer 10/11
- 1960: Pioneer Venus
- 1970: Life Sciences Research
- 1980: Air Transportation System
- 1990: Nanotechnology
- 2000: NASA Research Park
- 2015: Human Centered Computing

- 1940: CFD
- 1950: Hypervelocity Free Flight
- 1960: 80x120 Wind Tunnel
- 1970: Saturn V
- 1980: Galileo
- 1990: Mars Science Lab
- 2000: ISS
- 2015: LCROSS

- 1940: Tektites
- 1950: Flight Research
- 1960: Teledyne X-36
- 1970: Pioneer 10/11
- 1980: Pioneer Venus
- 1990: Galileo
- 2000: ISS
- 2015: LADEE

- 1940: Aero Institute
- 1950: Air Transportation System
- 1960: Space Biology
- 1970: SSERVI
- 1980: Astrobiology Institute
- 1990: NASA Research Park
- 2000: ISS
- 2015: SOFIA

- 1940: Nanotechnology
- 1950: Flight Research
- 1960: Tiltrotor
- 1970: SOFIA
- 1980: Mars Science Lab
- 1990: SSERVI
- 2000: ISS
- 2015: Kepler

- 1940: Lunar Prospector
- 1950: Flight Research
- 1960: Venera
- 1970: Life Sciences Research
- 1980: Nanotechnology
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- 2015: Kepler

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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.
difference from continuum

Wavelength (mm)

Observation  Model
H2O v   H2O i
CO2
SO2
CH4
CH3OH
H2S

187-216 sec Period
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
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?