

NASA & Ames Research Center

Introduction



Presented by:

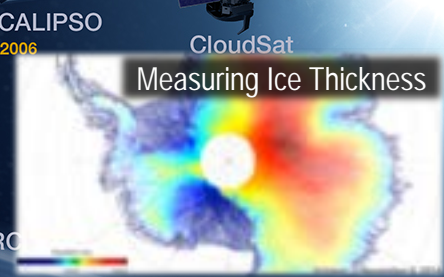
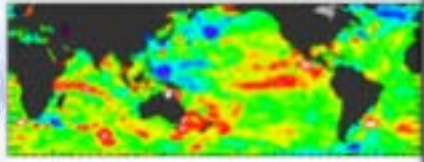
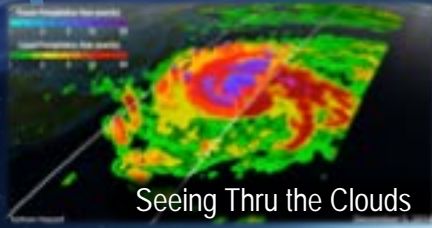
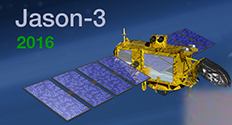
Dr. William (Bill) R. Van Dalsem
Deputy Director of Aeronautics
NASA Ames Research Center



Your Planet is Changing



RapidSCAT (ISS)
2014
CATS (ISS)
2015



Aura



Off the Earth, for the Earth



Dragon Cargo
(SpaceX)



Cygnus
(Orbital)



Crew Dragon (SpaceX)



CST-100 STARLINER (Boeing)



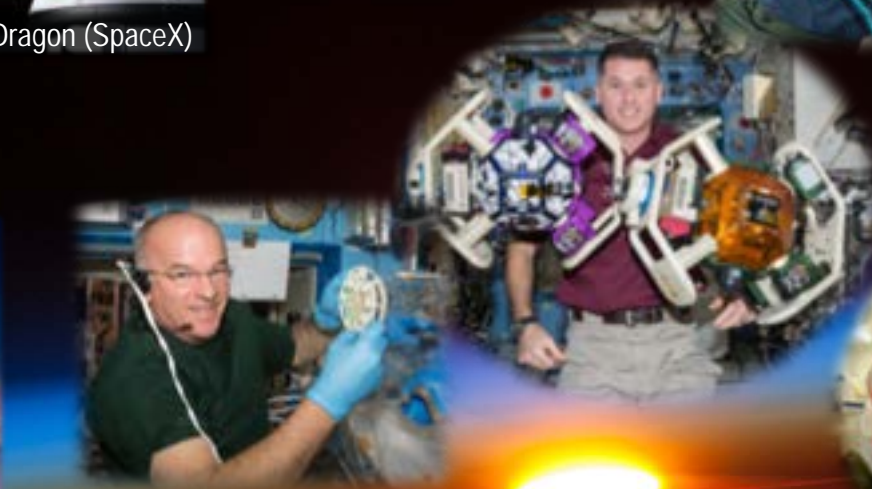
Atlas V (Boeing)



Antares
(Orbital)



Falcon 9
(SpaceX)

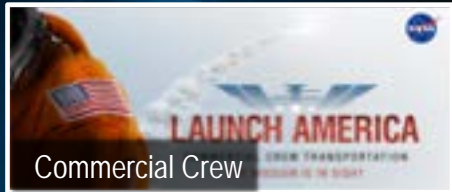


РОСКОСМОС



Join Us on the Journey

MARS



INTERNATIONAL SPACE STATION



ORBITERS
ROVERS AND LANDERS



COMMERCIAL CARGO AND CREW

ORION CREWED SPACECRAFT
DEEP SPACE HABITAT

SOLAR ELECTRIC PROPULSION
ASTEROID REDIRECT MISSION



MISSIONS: 6-12 MONTHS
RETURN: HOURS
EARTH RELIANT

MISSIONS: 1-12 MONTHS
RETURN: DAYS
PROVING GROUND

MISSIONS: 2-3 YEARS
RETURN: MONTHS
EARTH INDEPENDENT

SCIENCE

TECHNOLOGY

OPERATION

NASA: We're Out There

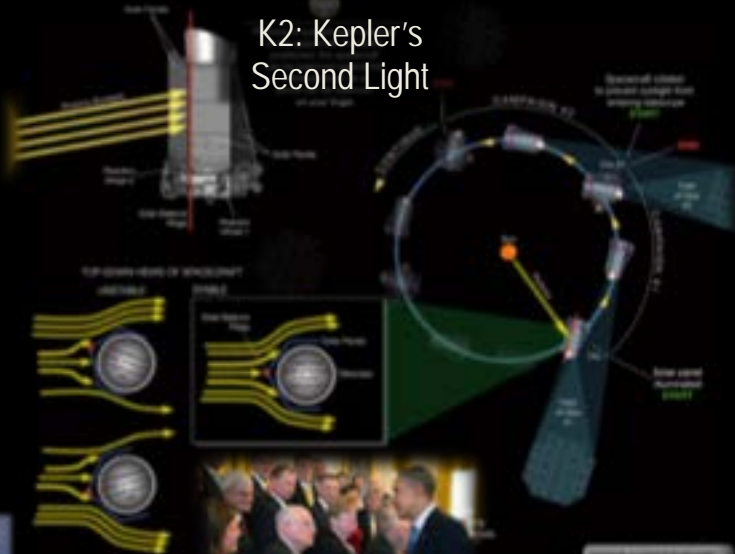


Hubble Space Telescope



James Web Space Telescope

K2: Kepler's Second Light



Origin and Nature of Life, Co-evolution with Planet Earth

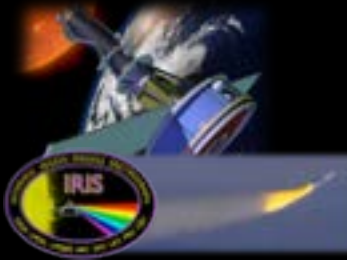
Mars: Habitability of Early Mars

Icy Worlds: Habitability and Life Detection



TESS

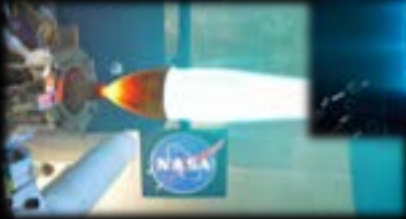
SOFIA



Technology Drives Exploration



Space Travel



Living in Space



Science Instruments



Manufacturing,
Materials,
3-D Printing



High-Tech Computing



Robotics



NASA Aeronautics

NASA Aeronautics Vision for Aviation in the 21st Century



NASA Centers and Installations



Ames
Research
Center

Plum Brook
Station

Glenn Research
Center

Independent
Verification and
Validation Facility

Goddard Institute for
Space Studies

Goddard Space
Flight Center

Headquarters

Wallops
Flight
Facility

Langley
Research
Center

Kennedy
Space
Center

Marshall Space
Flight Center

Stennis
Space Center

Michoud
Assembly
Facility

Johnson
Space
Center

White Sands
Test Facility

Armstrong Flight
Research Center

Jet
Propulsion
Laboratory

Ames is One of the Early NACA Laboratories



Joseph S. Ames



NACA

Langley

Ames

Lewis

Dryden

NASA

1915

1939

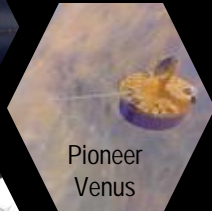
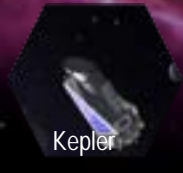
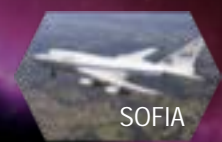
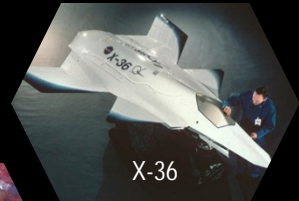
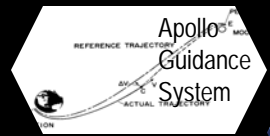
1940

1946

1958



75 Years of Innovation

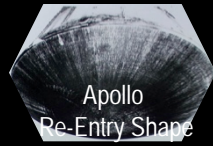
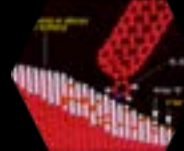


1980

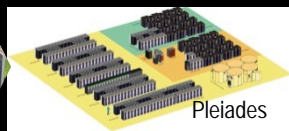
2000



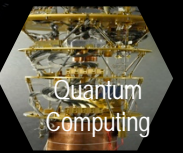
1970



1960



1940

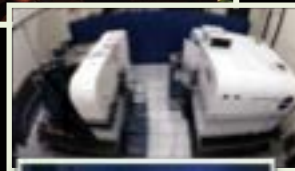
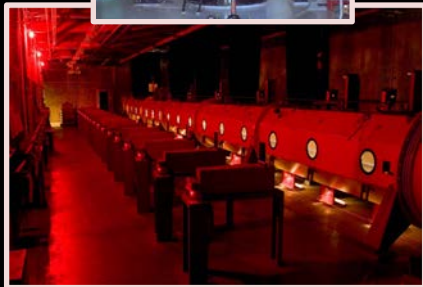
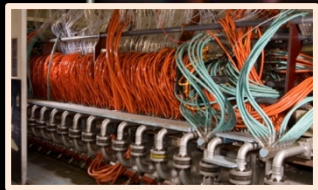


Ames Research Center



- Occupants:
 - ~1130 civil servants; ~2,100 contractors; 1,650 tenants
 - 855 summer students in 2016
- FY2016 Budget: ~\$915M (including reimbursable/EUL)
- ~1,900 acres (400 acres security perimeter); 5M building ft²
- Airfield: ~9,000 and 8,000 ft runways

Major Research Facilities



Wind Tunnels

ARC Jet Complex

Range Complex

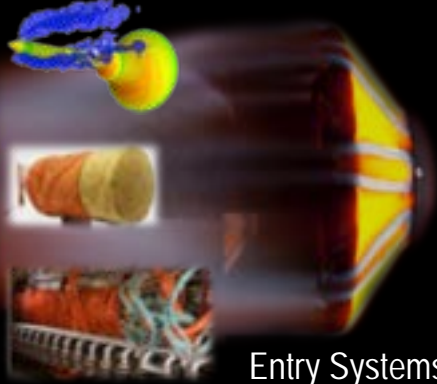
Simulators

Advanced Supercomputing

Core Competencies at Ames Today



Air Traffic Management



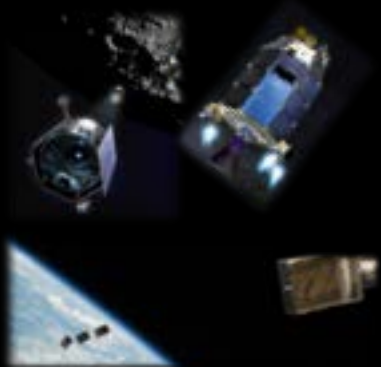
Entry Systems



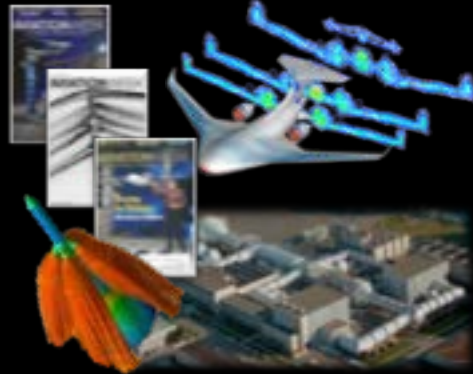
Advanced Computing & IT Systems



Intelligent/ Adaptive Systems



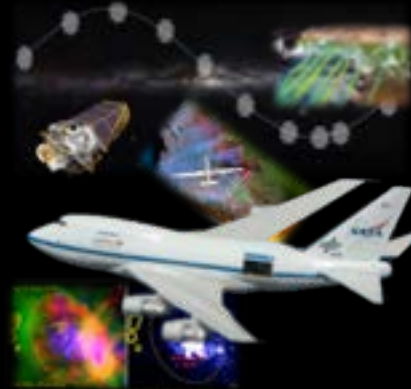
Cost-Effective Space Missions



Aerosciences



Astrobiology and Life Science

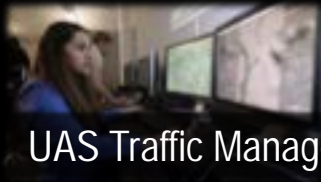


Space and Earth Sciences

Air Traffic Management



Air Traffic Demonstration – ATD-2



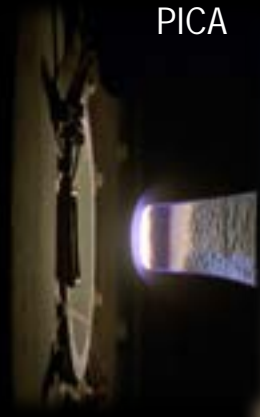
UAS Traffic Management



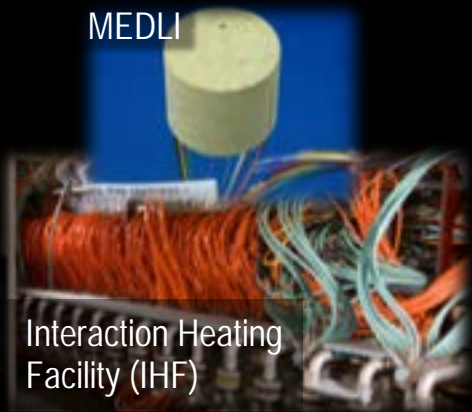
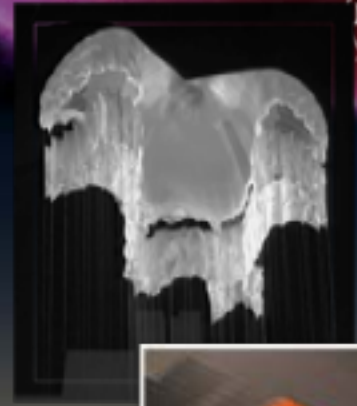
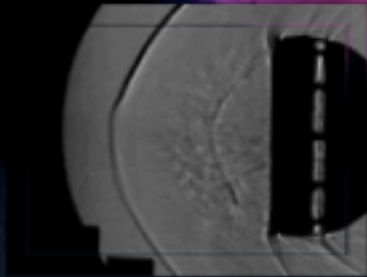
Entry Systems



MSL Thermal Protection System



PICA



MEDLI

Interaction Heating Facility (IHF)



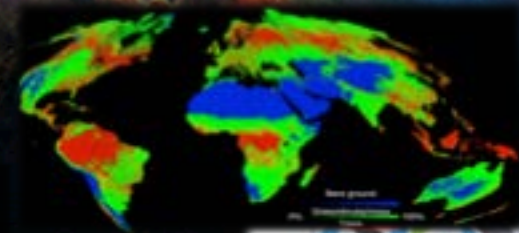
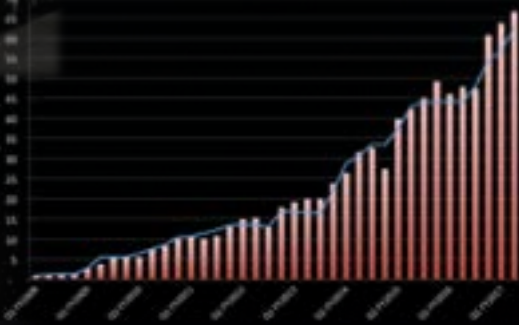
ADEPT



Advanced IT and Computing Systems



Supercomputing Systems



Big Data Analytics



NEX



Large Scale Visualization



Enterprise Managed Cloud Computing

Quantum Computing



Disruptive Technologies

Intelligent Adaptive Systems



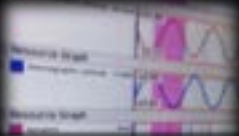
Mission Support Tools, Decision Support Tools



Autonomous Navigation

Self-Driving Car

Intelligent Adaptive Systems



Activity Mission Planning For Mars



Planning And Scheduling For Human Robotic Teams / Future



Astronauts Self-scheduling And Planning

Payload & Drill Subsystem



Planetary Lake Lander

Adaptive science for dynamic phenomena in deep-space missions. Field testing in Chile.



Activity Mission Planning For Crew On ISS

Distributed Ops Testing



Partnering Lander Concept



OVEN Reactor Heater



Self Driving Car

Adapt space robotics technology to "fleet management" use.



Synchronized Position Hold, Engage Reorient, Experimental Satellites



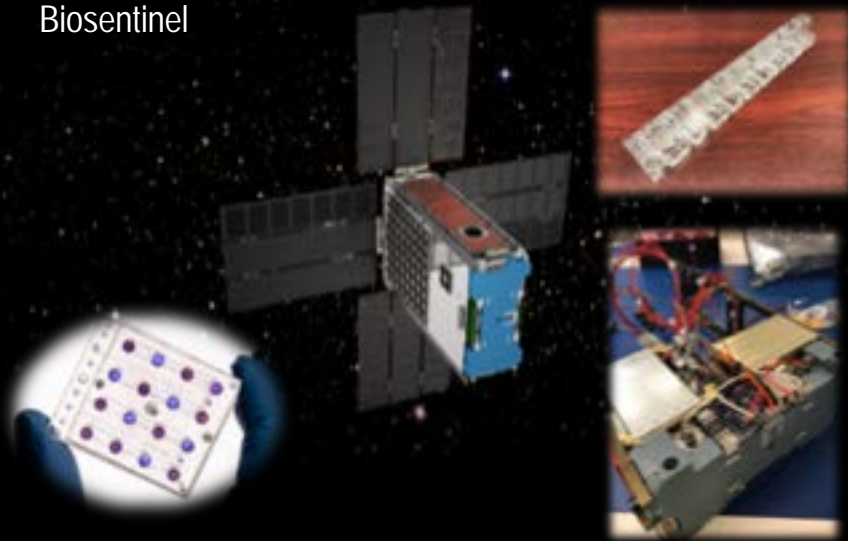
Astrobee Free-Flyer

Autonomous nav, docking and recharge, and mobile sensor IVA work on the ISS

Cost-Effective Space Missions @ Ames



Biosentinel



TechEdSat-4



TechEdSat-5

LCROSS (2009)



LADEE (2013)



PhoneSat (2013), EDSN (2013)

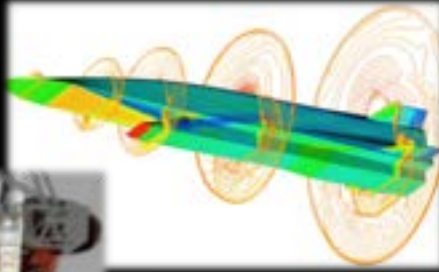
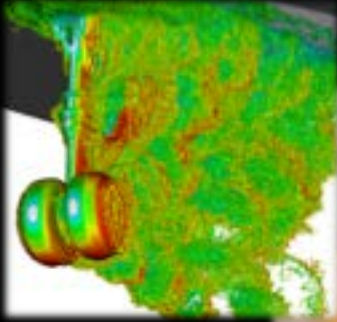


Aerosciences

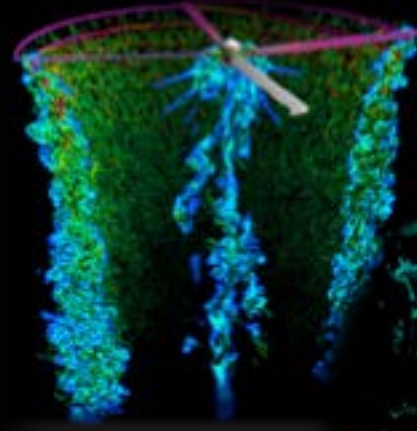


Modeling and Simulation

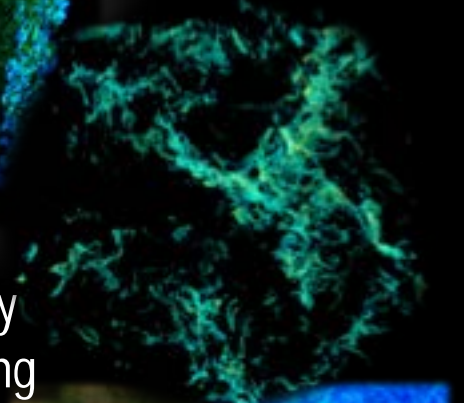
Advanced IT and Computing Systems



Capacity
Computing



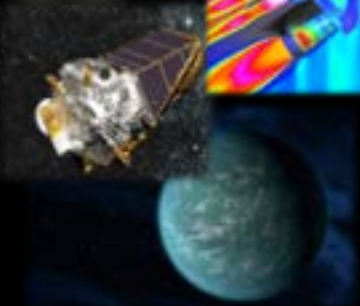
Capability
Computing



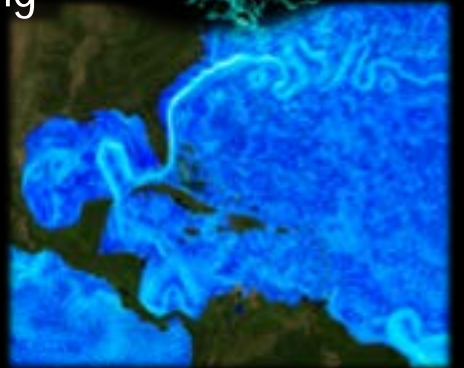
Time Critical Computing



KEPLER



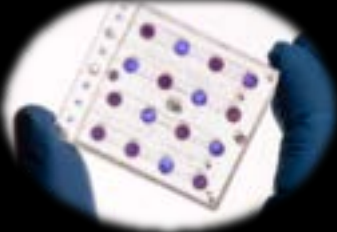
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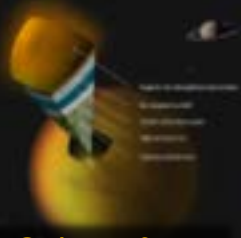
Astrobiology & Life Sciences



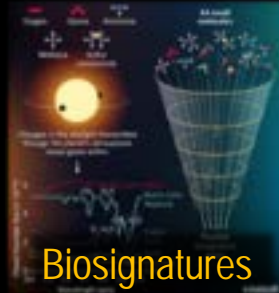
Microfluidic Sensors



Origins of life



Sub-surface planetary exploration



Biosignatures



Human research for space flight



Environmental life support



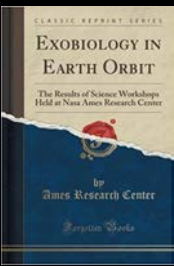
Radiation science



Synthetic biology



Gravitational Biology



Life detection



Missions



WetLab-2



Seedling Growth



Rodent Research

Space & Earth Sciences

Research Areas

- Extrasolar Planets
- Infrared Astrophysics
- Planetary Sciences
- Extreme Environments Field Research



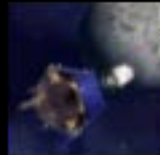
Resource Prospector



LADEE

Technology/Instruments

- Exoplanet Imaging Technologies
- Near-Mid Infrared Imagers & Spectrometers
- UV/Visible Spectrometers



LCROSS

Missions

- Operations: Kepler/K2, SOFIA, IRIS
- Development: TESS, Resource Prospector
- Completed: LADEE, LCROSS, Lunar Prospector



Kepler/K2

Centers of Excellence & Virtual Institutes

- Mars Climate Modeling Center
- Ames Astrochemistry Laboratory
- NASA Astrobiology Institute
- NASA Solar System Exploration Virtual Institute



SOFIA



Research Areas

- Atmospheric Sciences
- Biospheric Sciences
- Carbon Cycle & Ecosystem Modeling
- Applied Sciences

Technology/Instruments

- Airborne Remote Sensing & In Situ Instruments
- Small Unmanned Aerial Vehicles (UAVs)
- Wildfire Monitoring from UAVs

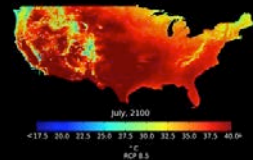
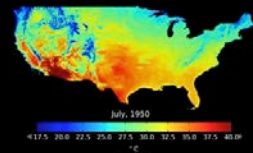


Centers of Excellence

- NASA Earth Exchange (NEX)
- Earth Science Projects Office (ESPO)
- Airborne Sensor Facility (ASF)
- Small Unmanned Aerial Vehicles (UAVs)

Recent Airborne Science Campaigns

- ORACLES (2015-2020): Aerosols, biomass bu
- ATom (2015-2020): Atmospheric tomography
- ATTREX (2010-2015): Tropical tropopause
- HS3 (2010-2015): Hurricanes & severe storms
- IceBridge (2009-2017): Polar icecaps



Partnerships at Ames



Inter-Agency

Commercial

Virtual Institutes



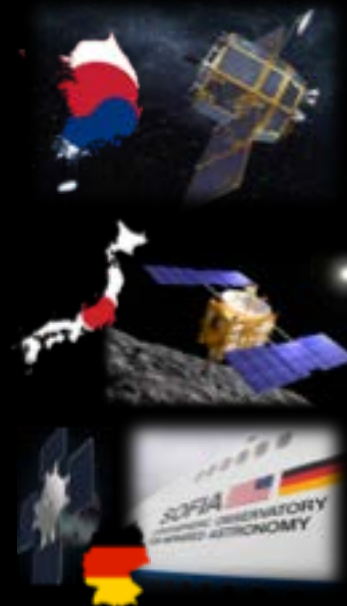
Academia



NASA Research Park



International



Come Join the Ames Family

Upcoming openings:

- Computer Scientists
- Engineers: Aerospace, Software, Electrical, Materials, Systems
- Physical Scientists: Astrobiology, Biosciences, Space, and Earth Sciences
- Business Operations (HR, Public Affairs, Procurement, IT)

Pathways and Education Programs: Internships, Fellowships, Intern Employment and Recent Graduate Program

- Engineering
- Physical Scientist
- Human Resources
- Finance
- Business Administration



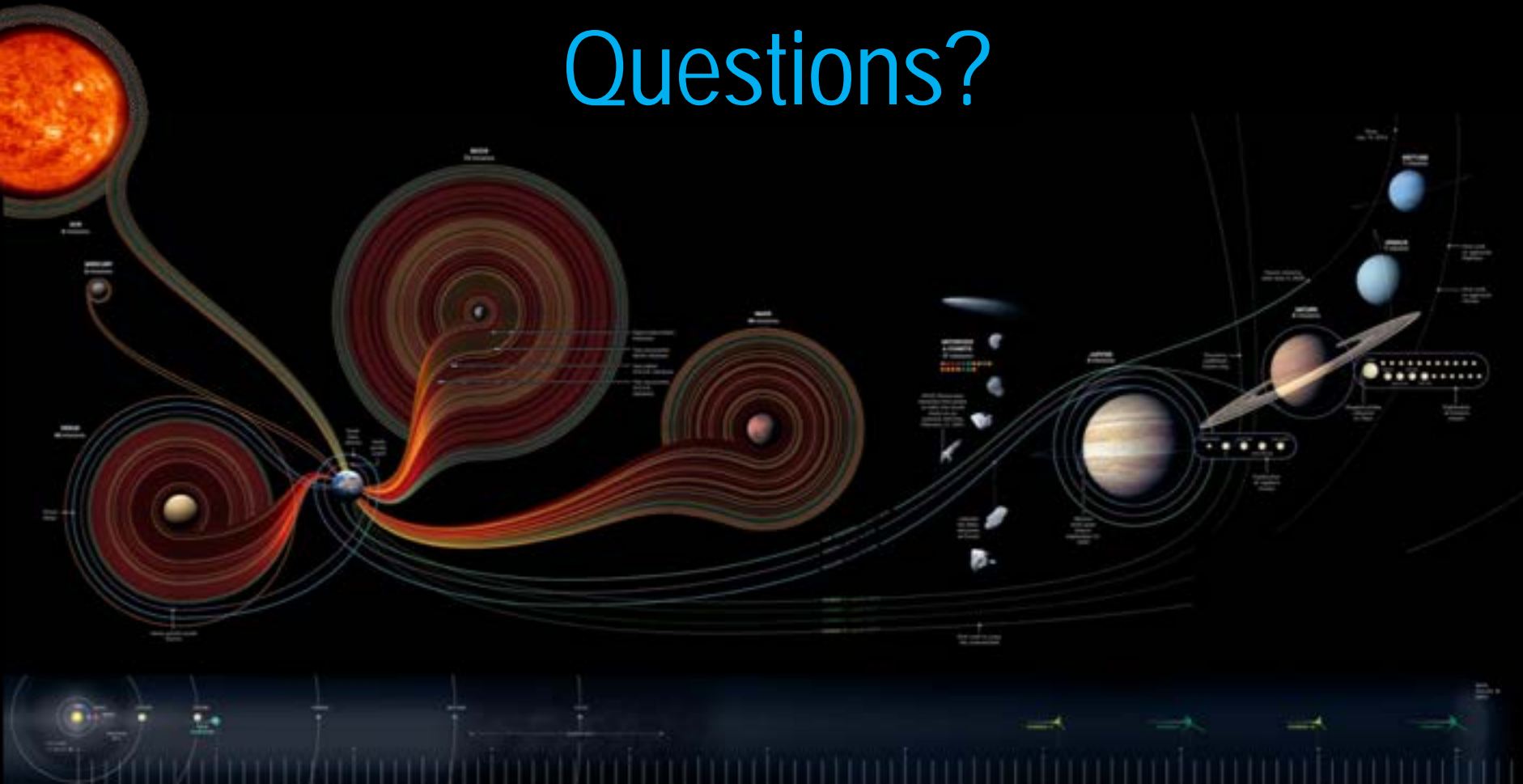
intern.nasa.gov

nasajobs.nasa.gov



nasapeople.nasa.gov

Questions?





EXPLORE FLIGHT

WE'RE WITH YOU WHEN YOU FLY

NASA Aeronautics Research

Dr. William (Bill) R. Van Dalsem
Deputy Director, Aeronautics Directorate
NASA Ames Research Center

www.nasa.gov |

Aviation is vital to our nation's economy



- \$82.5 billion positive trade balance
- \$1.6 trillion total U.S. economic activity
- 10.6 million direct/indirect jobs
- \$771 billion spent by air travelers in U.S. economy
- 18.1 million tons of freight transported by U.S. airlines

(Sources for statistics listed at <https://www.nasa.gov/aero/infographics.html>)

Mission Directorates

Aeronautics



Space Technology



Science



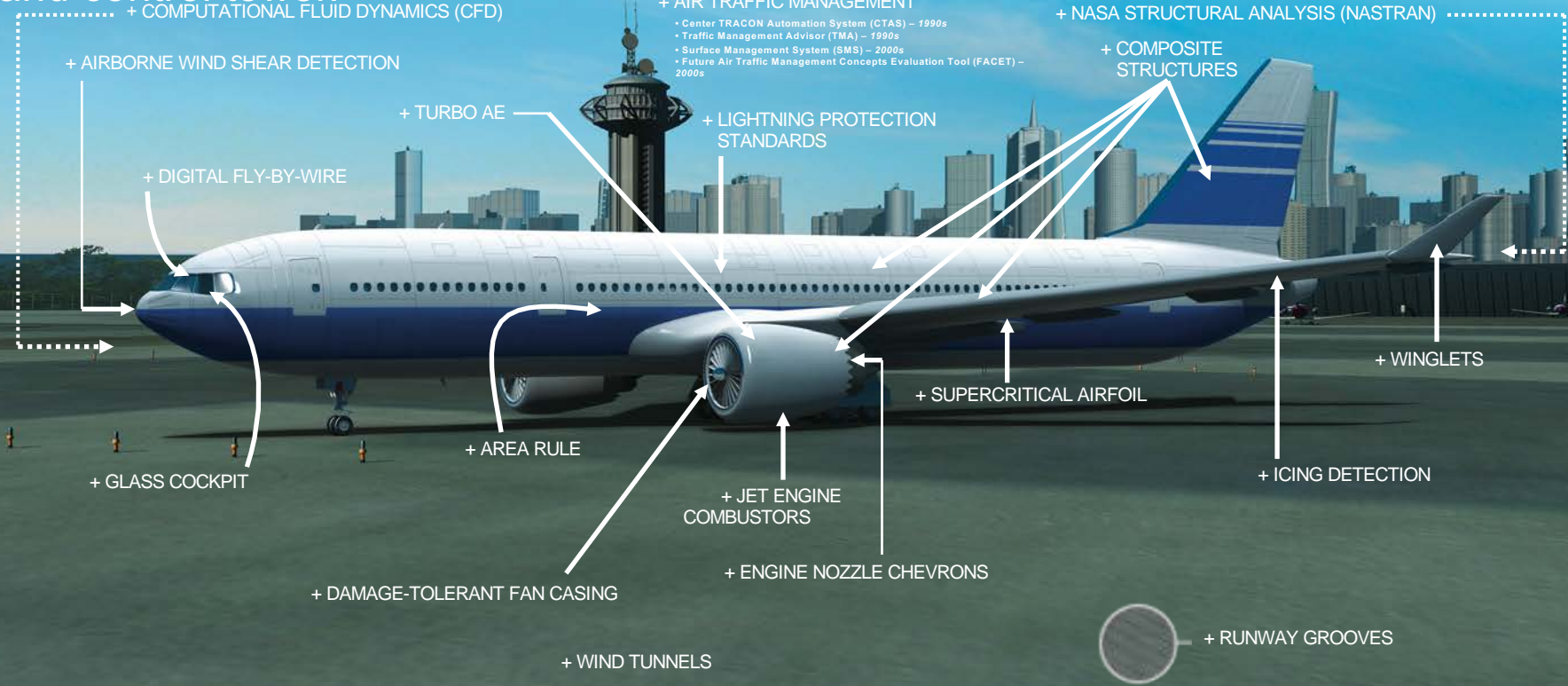
Human Exploration and Operations





NASA has made decades of contributions to aviation

NASA-developed technology is on board every U.S. commercial aircraft and control tower.



Less Noise: Chevron Nozzles



- \$82.5 billion positive trade balance
- \$1.6 trillion total U.S. economic activity
- 10.6 million direct/indirect jobs
- \$771 billion spent by air travelers in U.S. economy
- 18.1 million tons of freight transported by U.S. airlines

(Sources for statistics listed at <https://www.nasa.gov/aero/infographics.html>)

Global Growth in Aviation

Opportunities and Challenges

2017

4 BILLION
PASSENGER
TRIPS



2036

7.8 BILLION
PASSENGER
TRIPS

41,030
New Aircraft Deliveries

\$6.1 Trillion
Market Value

Asia-Pacific Market is Nearly

40%
of New Aircraft Deliveries

78%
of New Aircraft Deliveries are Single Aisle Class (including Regional Jets)

NASA Aeronautics Strategies for Research

We are meeting global aviation challenges by using six research thrust areas to organize our research.



Safe, Efficient Growth in Global Operations

- Achieve safe, scalable, routine, high-tempo airspace access for all users



Innovation in Commercial Supersonic Aircraft

- Achieve practical, affordable commercial supersonic air transport



Ultra-Efficient Subsonic Transports

- Realize revolutionary improvements in economics and environmental performance for subsonic transports with opportunities to transition to alternative propulsion and energy



Safe, Quiet and Affordable Vertical Lift Air Vehicles

- Realize extensive use of vertical lift vehicles for transportation and services including new missions and markets



In-Time System-Wide Safety Assurance

- Predict, detect and mitigate emerging safety risks throughout aviation systems and operations



Assured Autonomy for Aviation Transformation

- Safely implement autonomy in aviation applications





QUIET SUPERSONIC FLIGHT



AIR TRAFFIC

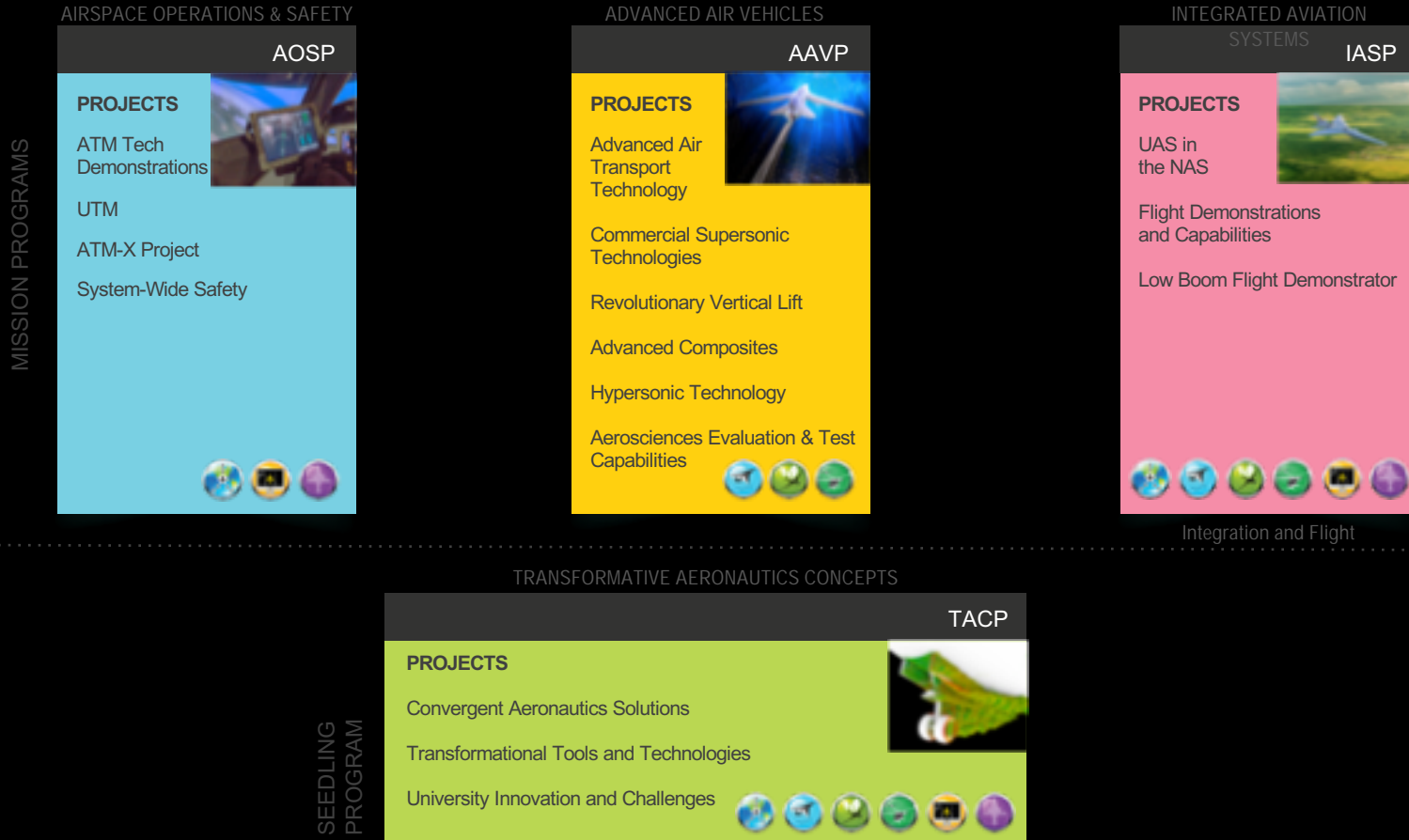


ELECTRIC PROPULSION



URBAN AIR MOBILITY

ARMD Research Programs & Projects Align with ARMD Strategy



Where does NASA aeronautics research happen?

Aeronautics research takes place at four of NASA's centers.



Major Areas of Inter-Center Collaboration

Langley/Glenn: Propulsion-Airframe Integration

Ames/Langley: Flight Deck & Ground Based Automation Integration; Flight Mechanics; Aerodynamics

Armstrong/Other Research Centers: Flight Experiment Integration

AMES



ATM Research and Technology & Integration

ARMSTRONG



Flight Research

GLENN



Propulsion Research and Technology

LANGLEY



Vehicle Research and Technology



FROM SONIC BOOM TO SONIC "THUMP" OVER LAND



Objectionable noise
reduced by more than
65%

Energy usage reduced
by more than
60%

Harmful emissions
reduced by more than
90%

HYBRID ELECTRIC



AERODYNAMICS

VERTICAL
LIFT

GPS

BATTERIES



COMMUNICATION

SOFTWARE

COMPUTER

IMAGING

CONVERGENCE

OF DISPARATE TECHNOLOGIES



URBAN AIR MOBILITY



FUTURE CITY

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