National Aeronautics and Space Administration

Aerospace Testing and Facilities Operations and Maintenance-4 (ATOM-4)

Industry Day/Pre-Proposal Conference

NNA14443194R-SLS

April 29, 2014

AGENDA

Registration	9:00-9:30	
Introduction and Procurement Overview	9:30-10:00	Ms. Starr Strong, Contracting Officer
Wind Tunnel Overview	10:00-10:45	Mr. Frank Kmak, AO Division Chief
ThermoPhysics Facility Overview	10:45-11:30	Mr. George Raiche, TSF Division Chief
Questions/Discussion	11:30-12:00	
Tour of Facilities	1:00-4:00	

This Industry Day/Pre-Proposal Conference is intended to:

(1) Familiarize participants with the ATOM-4 Statement of Work (SOW) requirements;

(2) Provide the current status of the ATOM-4 acquisition;

(3) Permit potential offerors an opportunity to network and discuss teaming or subcontracting arrangements;

(4) Allow potential offerors an opportunity to submit questions regarding the recently posted draft Request for Proposal; and

(5) Allow industry representatives an opportunity to ask questions pertaining to the ATOM-4 requirements.

General Guidance

- These slides shall not be interpreted as a comprehensive description of the Government's requirements. Please refer to the draft Statement of Work and draft Request for Proposal.
- Nothing discussed at this pre-proposal conference shall be construed as a revision to the draft Request for Proposal.
- If there are any inconsistencies between this presentation and the Final Request for Proposal, the Final Request for Proposal will govern.
- Communications blackout period will be invoked when the Final RFP issued.

Questions

- Following the presentations and walking tour, all questions must be submitted in writing. All questions will be answered in a timely manner. All questions and answers will be made available on the NASA Acquisition Internet Service and Federal Business Opportunities websites.

- Index cards have been provided to submit your questions.

- All questions related to this pre-proposal conference or the draft Request for Proposal must be submitted to the Contracting Officer at **starr.l.strong@nasa.gov** no later than May 2, 2014.

Electronic Posting

- All documents pertaining to the ATOM-4 Procurement can be found at the following links:

  NASAAcquisition Internet Service (NAIS) Business Opportunities:
  https://prod.nais.nasa.gov/cgibin/eps/bizops.cgi?gr=D&pin=21&

  OR

  Federal Business Opportunities (FBO):
  https://www.fbo.gov/index?s=opportunity&mode=list&tab=list&tabmode=list&

- These charts and the attendance list will be posted to the above sites.

FOIA Requests

- Freedom of Information Act (FOIA) Requests may be submitted electronically to Lubna M. Shirazi at foia@arc.nasa.gov
- No proprietary information will be disclosed.
- The NASAARC FOIA Electronic Reading Room can be accessed at http://www.nasa.gov/centers/ames/business/foia/elec.html

ATOM-4 Requirements Overview

- This will be a follow-on contract to the existing ATOM contract (NNA09DB39C), which has a performance period of July 1, 2009 through June 30, 2014.

- This procurement is intended to provide operations, maintenance, and repair of Testing and other ground-based facilities at ARC.

- Organizations supported –
  AO – Wind Tunnel Operations Division
  TSF – ThermoPhysics Facilities Branch

- NAICS Code: 561210 Facility Support Services

- Small Business Administration Size Standard: $35.5M

Acquisition Description

- Single Award Hybrid contract with Cost-Plus-Award-Fee (CPAF) Requirement and an Indefinite Delivery Indefinite Quantity (IDIQ) CLINS (CPAF, Time and Material (T&M), and Firm Fixed Price (FFP) task orders.
- Five-year performance period consisting of a two-year Base and three one-year Options
  - A 30-day Phase-in Period will be included in the Base
- The majority of the work will be performed on-site at NASA Ames. Researchers from ARC, other NASA Centers, other Federal agencies, and from the commercial community will utilize the facilities for testing programs.
- Installation-provided property includes access to office equipment, space, and supplies, and Center services (printing, reproduction, store stock, utilities, etc.)

SPECIAL CONTRACT REQUIREMENTS

G.2 AWARD FEE FOR SERVICE CONTRACTS

H.17 ORGANIZATIONAL CONFLICTS OF INTEREST, AND LIMITATION OF FUTURE CONTRACTING

The Contractor shall not, during the performance of the contract and for a period of three years following completion of performance thereof engage in the following activities: Design, develop, or produce aircraft, airframes, aircraft engines, advanced aerospace vehicles, or Thermal Protection Materials and Thermal Protection Systems such as heat shields for atmospheric reentry

An OCI Mitigation Plan is required with proposal

SPECIAL CONTRACT REQUIREMENTS

H.15 ARC 52.231-91 CONTRACTOR PURCHASING

- The contractor shall not perform purchasing functions or act in any other way as an agent for the government.

H.18 NON-PERSONAL SERVICES

- The Contractor shall not perform any inherently governmental actions under this contract.

No Contractor employee will be directly supervised by the Government.

Attachment J.1(a)(10) DOD Contract Security Classification Specification (DD254)

- Contractor Facility Clearance Level - Secret

Acquisition Strategy

- This procurement will be conducted through a full and open competition pursuant to FAR and NFS Part 15—Contracting by Negotiations.

- FAR 52.215-1 and NFS 1815.209 allow for an award to be made without discussions. The Government may award a contract based solely on the initial proposals received. The Government reserves the right to hold discussions if award on the basis of initial offers is determined not to be in the best interest of the Government. If discussions are necessary, then a competitive range will be set and negotiations will commence.

Small Business Goals

- All Offerors, except small businesses, must complete the portion of the instructions specific to the Small Business Subcontracting Plan. Small businesses are not required to submit Small Business Subcontracting Plans; however, small businesses are required to indicate the amount of effort proposed to be done by a small business either at the prime level or at the first tier subcontract level.

- The Government assessed the appropriate subcontracting goals for this acquisition.

- The small business goals for this procurement are as follows:
  - Small Business (SB): 30%
  - Small Disadvantaged Business (SDB) Concerns 5.0%
  - Women Owned Small Business (WOSB) Concerns 8.0%
  - Historically Black Colleges and Universities (HBCU)/Minority Institution (MI) 1.0%
  - HUBZone (HBZ) Small Business Concerns 2.5%
  - Veteran Owned Small Business (VOSB) Concerns 3.0%
  - Service-Disabled Veteran-Owned Small Business (SDVOSB) Concerns 2.4%

Weighting and Scoring

•Solicitation evaluation factors will include: Mission Suitability, Past Performance, and Cost.

•**Of the evaluation factors identified above, Mission Suitability is moderately more important than Past Performance, and Past Performance is moderately more important than Cost.** Mission Suitability and Past Performance when combined are significantly more important than Cost. Offerors should note that items within any factor, if found to be unsatisfactory, may be the basis for rejection of an offer.

Proposal Preparation

- Proposals shall be prepared in accordance with the Final RFP and subsequent written Amendments, if any.

- Ensure that all Amendments are acknowledged with the proposal submission.

Acquisition Schedule
Tentative

• Synopsis Issued	October 24, 2013
• Draft RFP Issued	March 31, 2014
• Industry Day/Pre-Proposal Conference	April 29, 2014
• **Questions/Comments Due**	**May 2, 2014**
• Issue RFP	May 2014
• Receipt of Proposals	July 2014
• Contract Award	November 2014

Please note that these dates are subject to change. Updated milestones will be provided if necessary.

Additional Information

Contracting Officer:

Starr L. Strong
650-604-4699
starr.l.strong@nasa.gov

Location of current information can be found online at the NASA Business Opportunities or Federal Business Opportunities websites. Please search using either the solicitation number **NNA14443194R-SLS** or the procurement title: **AEROSPACE TESTING AND FACILITIES OPERATIONS AND MAINTENANCE ATOM 4.**

QUESTIONS AND COMMENTS ARE REQUESTED ON ALL AREAS OF THE DRFP

QUESTIONS AND COMMENTS DUE BY May 2, 2014

Technical Area Overviews

National Aeronautics and Space Administration

Wind Tunnel Division (Code AO)

Frank Kmak
Chief, Wind Tunnel Division

Agenda

- **SOW Requirements**
- **Overview of NASA-Ames and Facilities**
- **Ames Unitary Plan Wind Tunnel Overview**
  - **Mission**
  - **Organizational Structure**
  - **Branch Functions/Requirements**

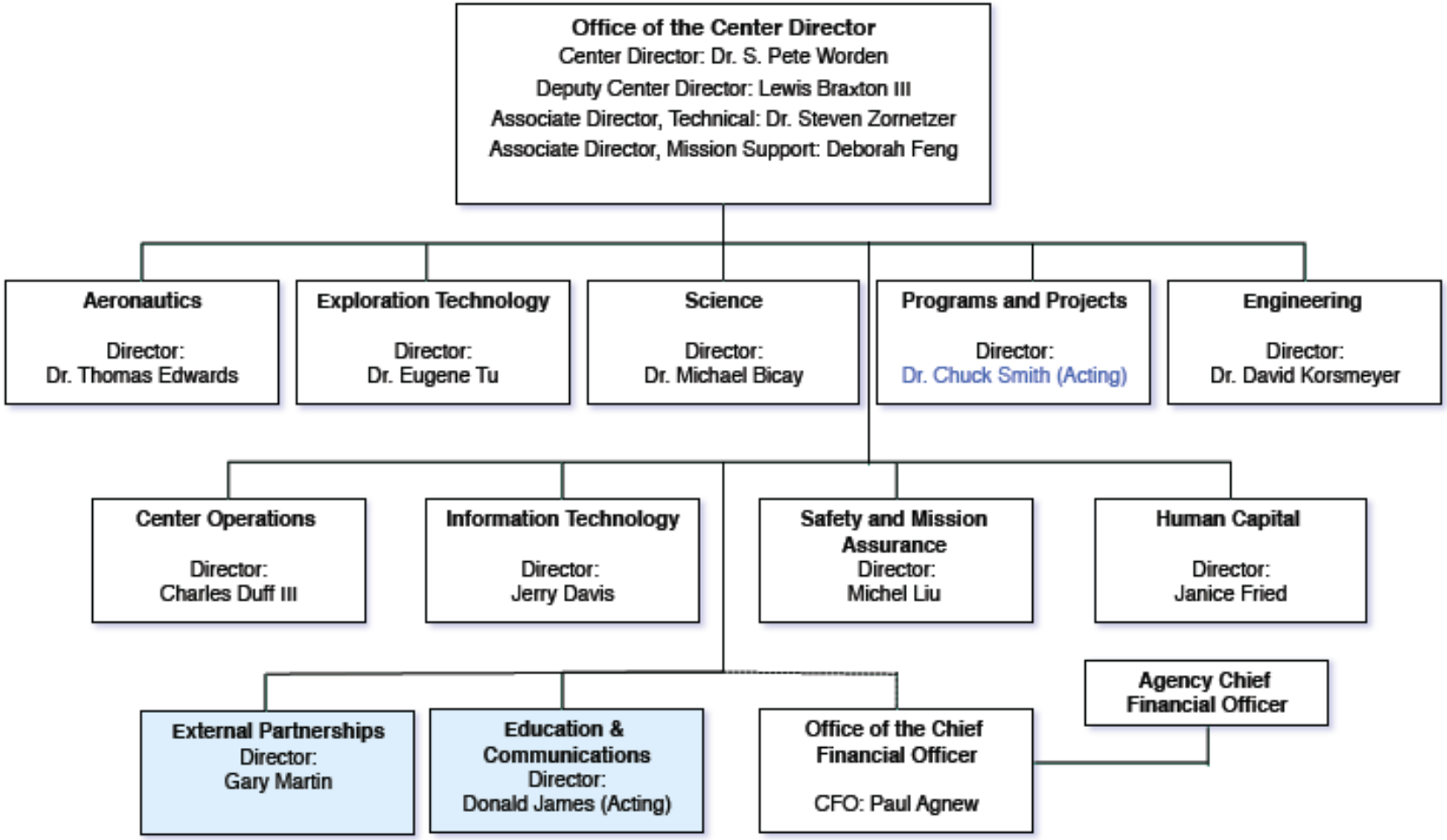
SOW Requirements

- **Testing Services**
  - Test Planning
  - Test Preparation
  - Test Operations
  - Post-Test Operations
- **Development Services**
  - Test/Diagnostic Techniques
  - Construction
  - Model/Test Apparatus
- **General Services**
  - Operation of Support Facilities
  - Maintenance, Calibration, and Repair
- **Contract Management and Administration**
  - Property Management
  - Procurement
  - Safety and Environmental Compliance
  - Contract Reporting

NASA Ames Research Center
Wind Tunnel Division

RANGES ★ ARC JETS ★ SENSORS
TSF
THERMOPHYSICS FACILITIES BRANCH
SPACE TECHNOLOGY DIVISION

Ames Organizational Structure



Wind Tunnel Division Organization

Wind Tunnel Division, Code AO

Frank Kmak, Chief

Wind Tunnel Operations Branch, Code AOO

Thomas Hegland, Chief

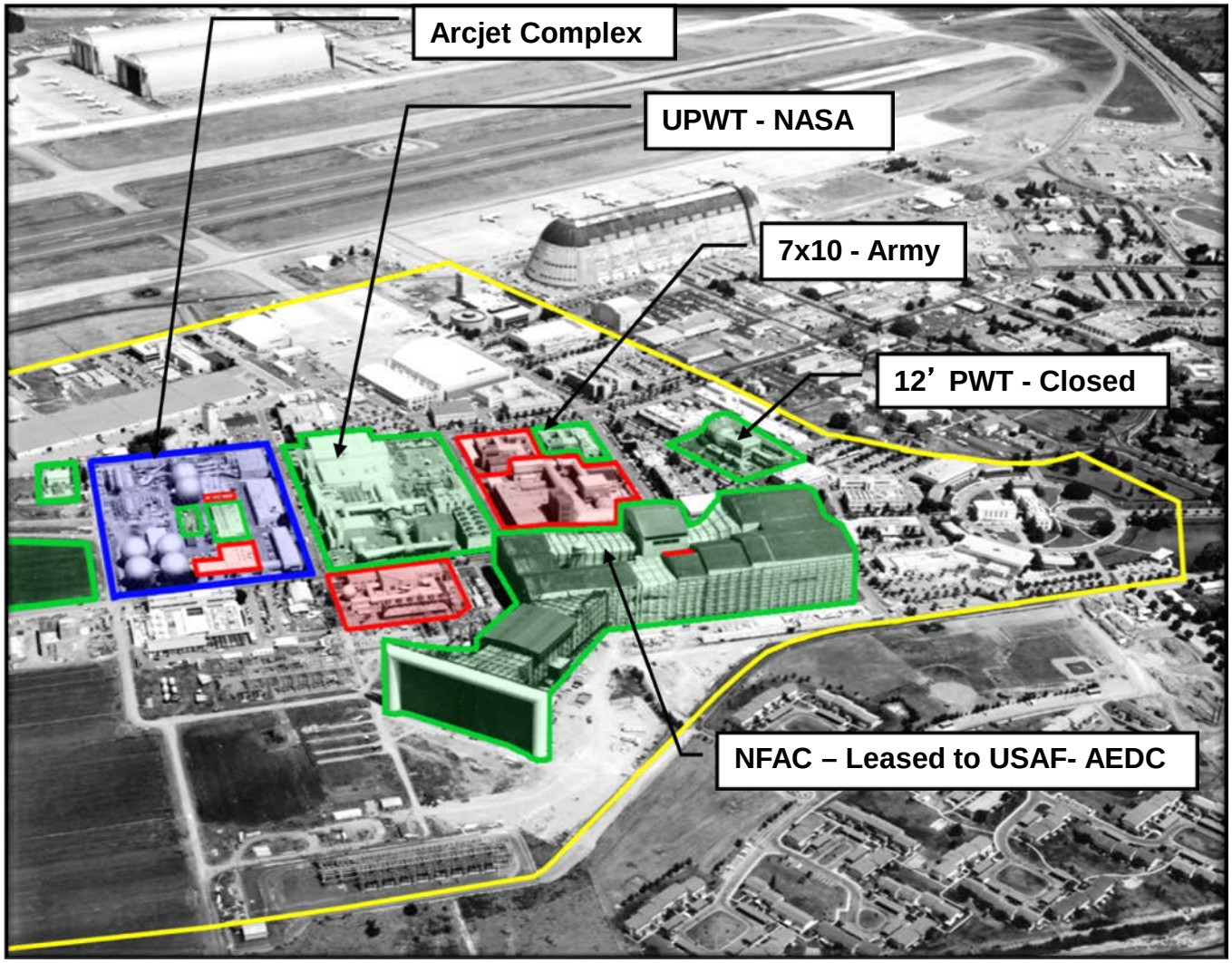
Wind Tunnel Systems Branch, Code AOI

Jon Bader, Chief

Experimental Aero-Physics Branch, Code AOX

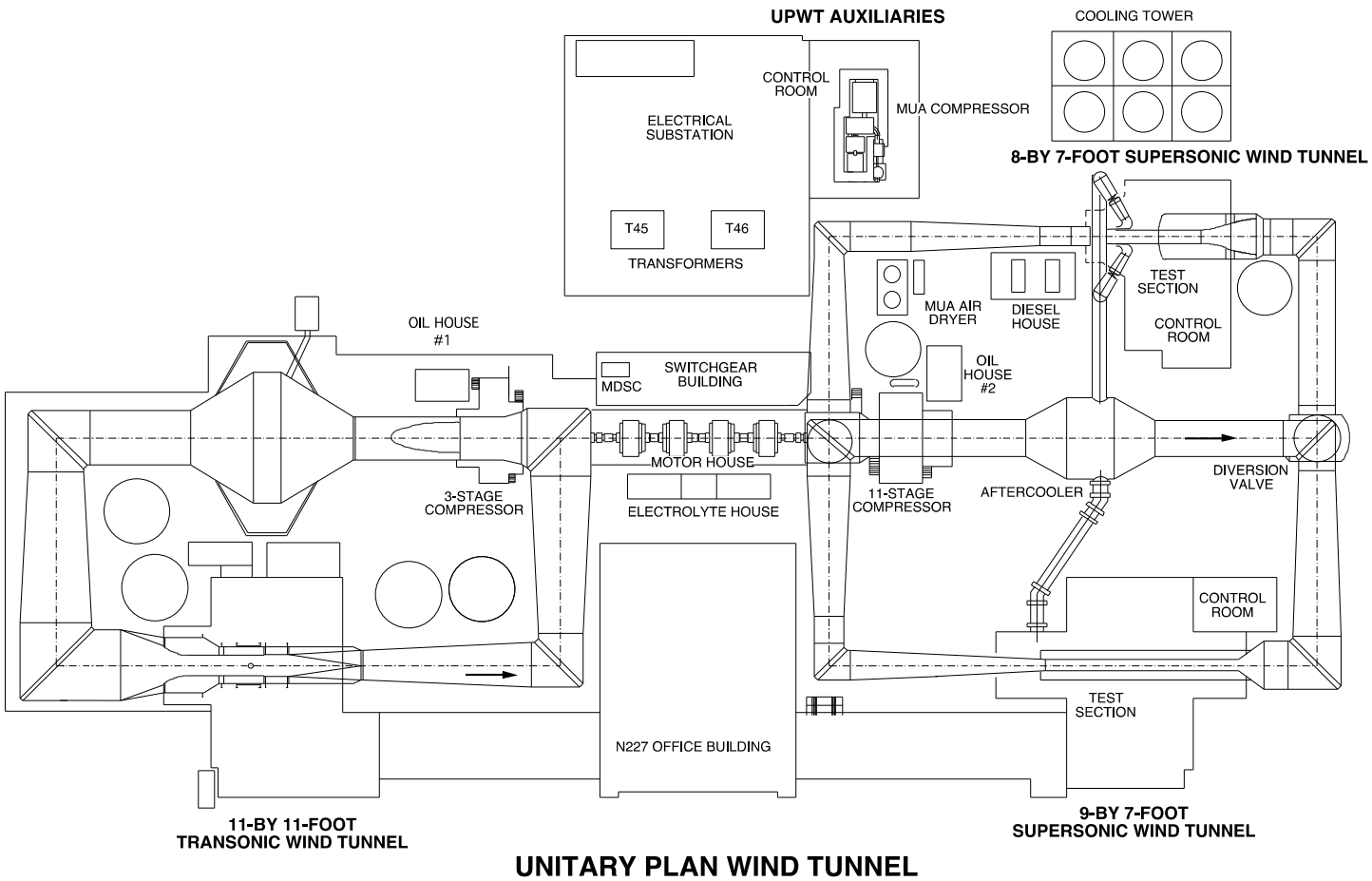
Rabi Mehta, Chief

Ames Ground Testing Facilities



ARC Unitary Plan Wind Tunnel

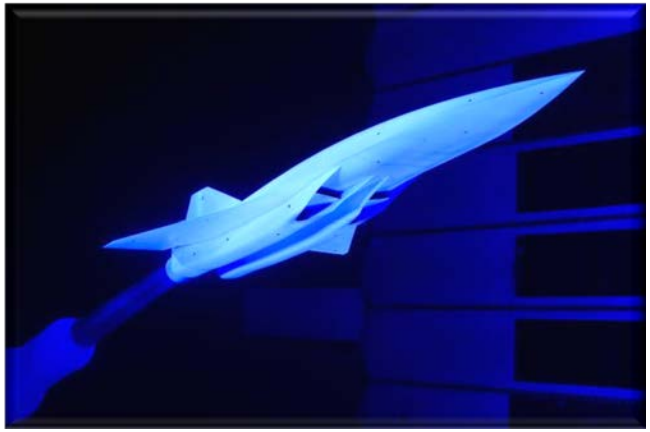
Unitary Plan Wind Tunnel

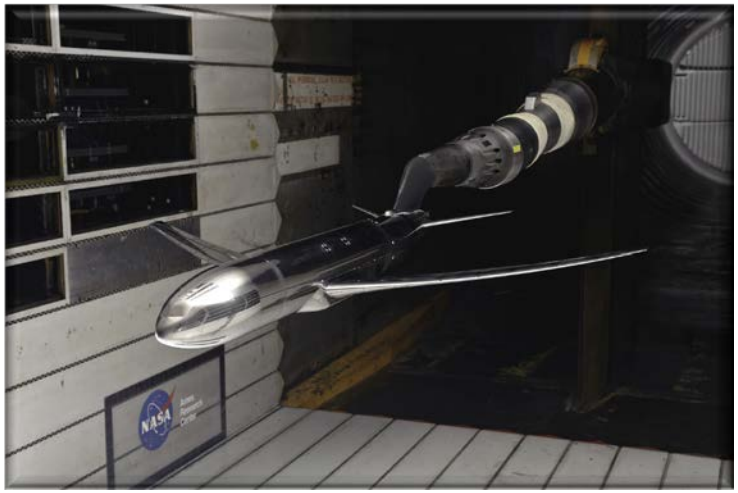


Ames Wind Tunnel Mission

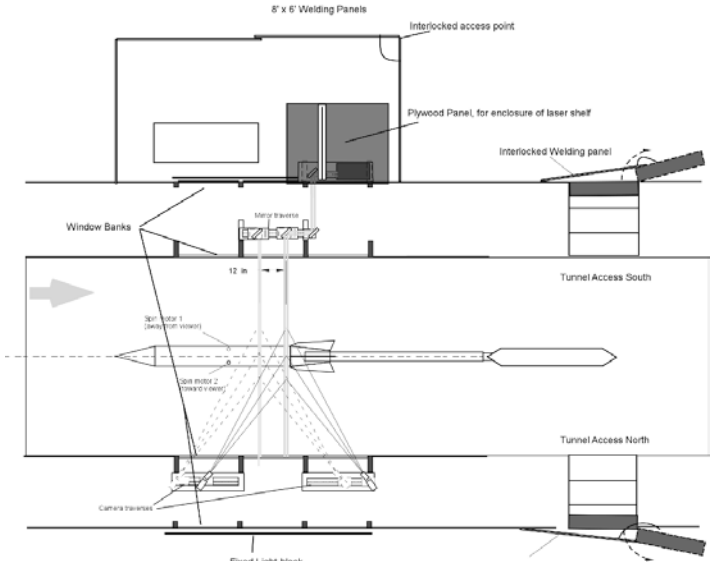
- **Meet Customer Testing Requirements**
- **Safely Operate and Maintain the Tunnels and Support Systems**
- **Maximize Use of Facilities**
  - Improve Testing Capability
    - **Test Techniques**
    - **Facility Maintenance Investment projects**
    - **Capability Advancement projects**
    - **Surpass Customer Expectations (Costs/Capabilities)**
  - Improve Cost Competitiveness

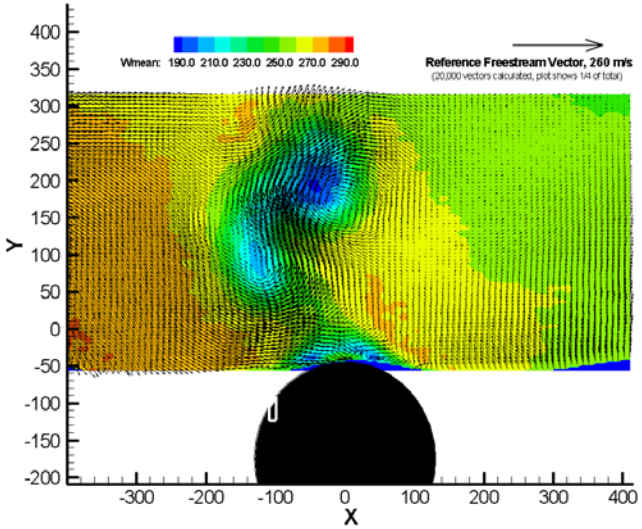
Ames Unitary Wind Tunnel Testing





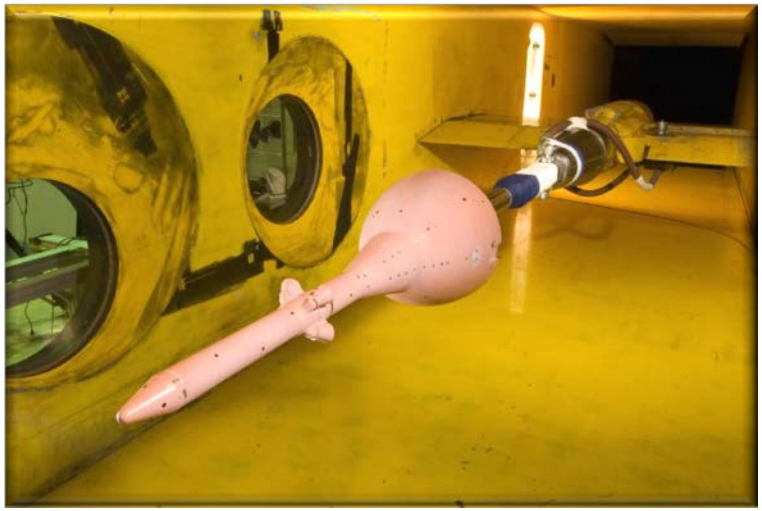
PIV in the 11’ x 11’ Transonic Test Section





Wind Tunnel Testing at Ames

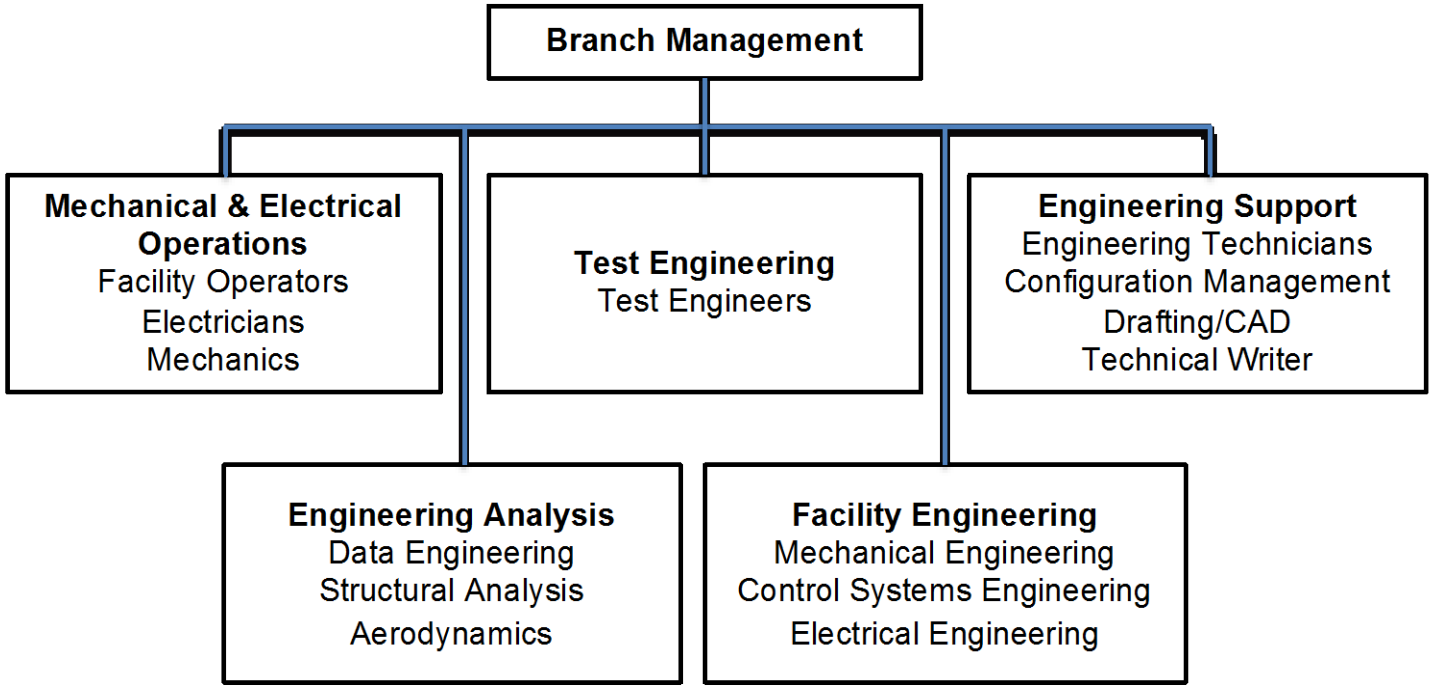
Unitary Wind Tunnel Testing



Major Stakeholders

- **Unitary Plan Wind Tunnel Customers**
  - **NASA Programs and Missions such as the Fundamental Aeronautics Program, Space Launch System, and Orion**
  - **Department of Defense**
  - **Commercial industry, including NASA Commercial Crew Program partners**
- **NASA's Aeronautics Test Program (ATP)**
  - **ATP provides basic funding for operations, test technology projects, maintenance projects, and capability advancement projects**

AOO Branch Structure



AOO Branch Mission

Plan, Direct, Lead, & Operate

- Plan, Coordinate, and lead all test activities from test justification through data transmittal
- Ensure that data quality meets customer requirements
- Oversee day-to-day operation of all wind tunnels and facilities
- Operate the tunnel and model control systems
- Responsible for model integrity, system safety, and safe operating procedures
- Develop and maintain test crew assignments
- Develop advanced test techniques and procedures
- Calibrate wind tunnel facilities
- Develop test process and test planning guidelines

AOO Branch Mission (Cont.)

Plan, Direct, Lead, & Operate

- Develop safety guidelines and procedures
- Develop facility maintenance procedures and schedules
- Manage the MAXIMO maintenance productivity software tool
- Maintain wind tunnel facilities at a high state of readiness and productivity through active maintenance
- Propose, develop, and coordinate major Construction of Facilities projects
- Provide Configuration Management services to manage the change of documents, drawings, and software
- Provide engineering support for development and repair of wind tunnel facilities

AOO Skill Categories

- Wind Tunnel Test Engineers
  - Test Managers
  - Shift Engineers
- Tunnel System Operators and Technicians
  - Tunnel and Model Support Operators
  - Auxiliaries Facility and HPA System Operators
- High Voltage Electricians
- Wind Tunnel Model Stress Analysts
- Mechanical & Electrical Engineers
- Control System Engineers
- Aerodynamics Research Analysts
- Configuration Management Specialists
  - Drafting
  - Technical Writing – MIS Support

AOI Branch Structure

Branch Management

Software Development
Applications Programmers
System Administrators
Software Development Programmers

Instrumentation Engineering
Instrumentation Engineers
Systems Engineers
Instrumentation Development Engineers

Instrumentation Support
Instrumentation Technicians
Computer Systems Technicians

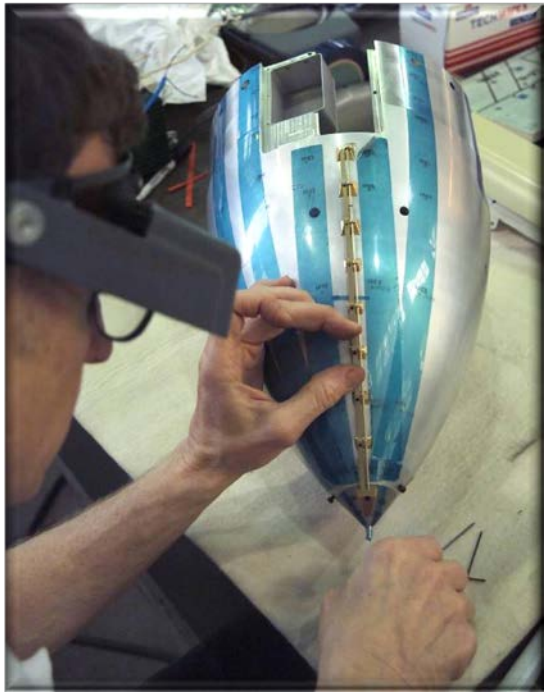
AOI Branch Mission

Collect Data

- Provide, configure, operate, and support (1) sensors, (2) instrumentation, (3) data systems and (4) related systems used to gather test data for customers
- Develop hardware, software, and processes to enhance and improve the quality of the data and the efficiency of the data gathering process
- Assist the customers and the AOO test team members in viewing/reviewing the data during and after a wind tunnel test

AOI Job Classifications

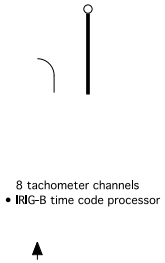
- Instrumentation Engineers
- Instrumentation Technicians
- Applications Programmers
- Computer Systems Technicians
- Systems Administrators
- Systems Engineers
- Instrumentation Development Engineers
- Software Development Programmers



Unitary Standard Data System

SDS

SIMPLIFIED BLOCK DIAGRAM OF 9x7 DATA SYSTEM



Ames Wind Tunnel Direction

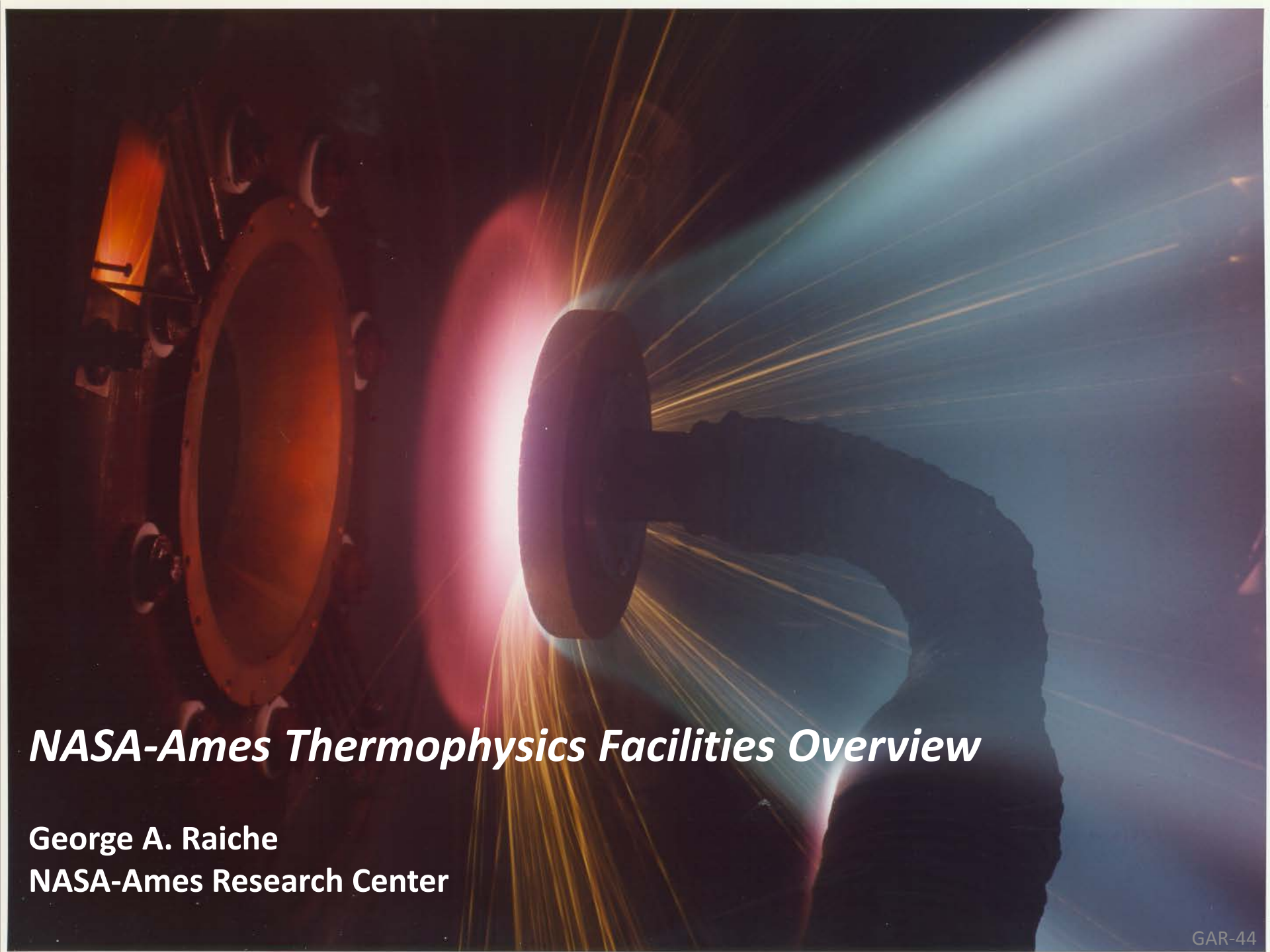
- **Past**
  - High Demand for Wind Tunnel Testing
- **Present**
  - Good Diversity of Testing
  - Viewed as a National Asset
- **Future**
  - NASA's role/mission in Aeronautics and Space Exploration is established
  - Very Competitive Wind Tunnel Industry

Partnership

NASA and Contractor Must Partner to Succeed

Equally Share in Wind Tunnel Mission/Vision

- **Management**
  - Business Model Stakeholder
  - Expanding Customer Base
- **Workforce**
  - Watch Out for Each Other and Customers
    - Improve Safety, Productivity and Overall Customer Experience
  - Part of the Ames Community



NASA-Ames Thermophysics Facilities Overview

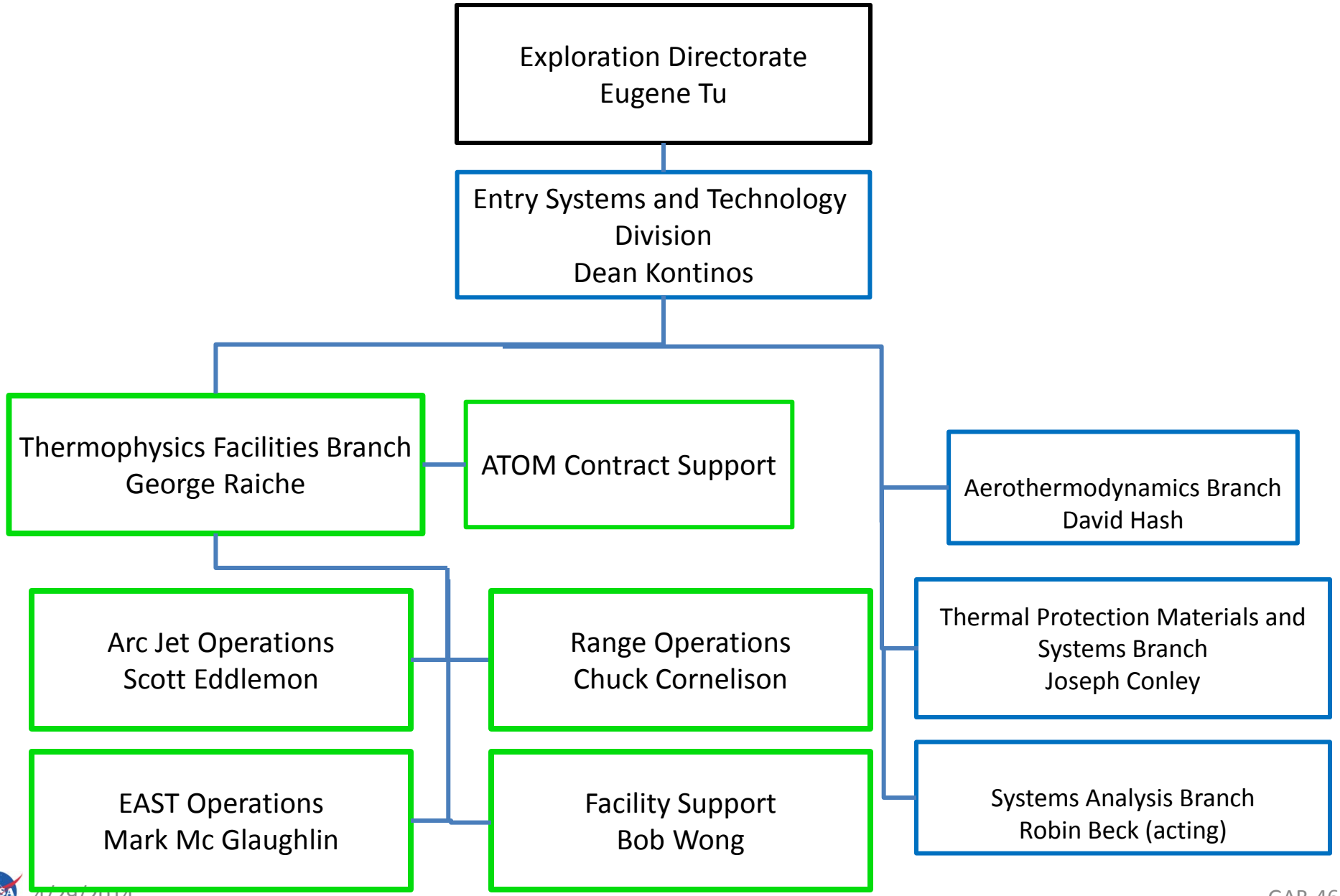
George A. Raiche
NASA-Ames Research Center

Our Mission:

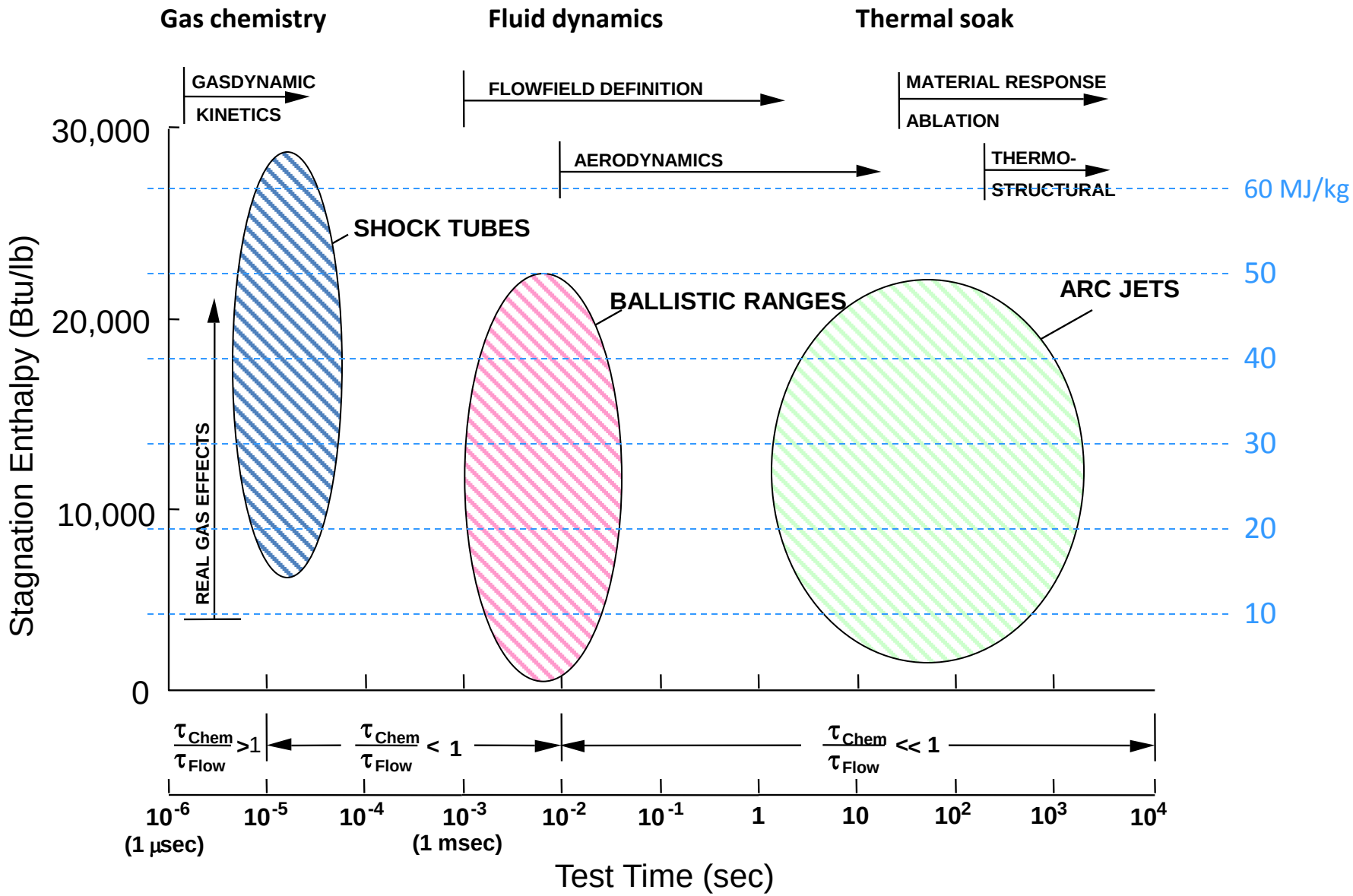
- **Conduct *safe* and *efficient* operations of the high-enthalpy thermophysics facilities at ARC.**
- Support Agency and US Government missions by providing ground-based high enthalpy simulation services for DDT&E of thermal protection materials, aerothermodynamic design, and vehicle structures.
- Develop and promote best practices for high enthalpy mission support and R&D.

- The arc jet complex is NASA's sole **production-class** capability for high enthalpy testing.
- Our customers include any NASA mission requiring a heat shield; commercial spacecraft developers; and DoD.

Facility Organization Overview

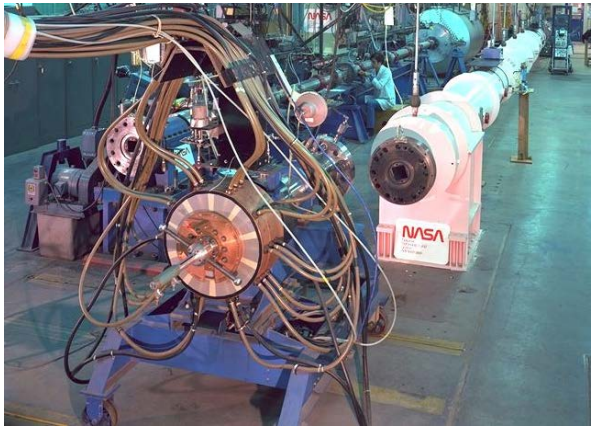


Energy and Time Domains for Hypervelocity Heating Phenomena



Ballistic Range Complex

Electric Arc Shock Tube
Aerothermodynamics



Simulates the effects of radiation and ionization during planetary entries by launching isolated shock waves through atmospheric simulation cell. The driven section of the facility is supplied by a 1.25 [MJ] capacitor storage system.

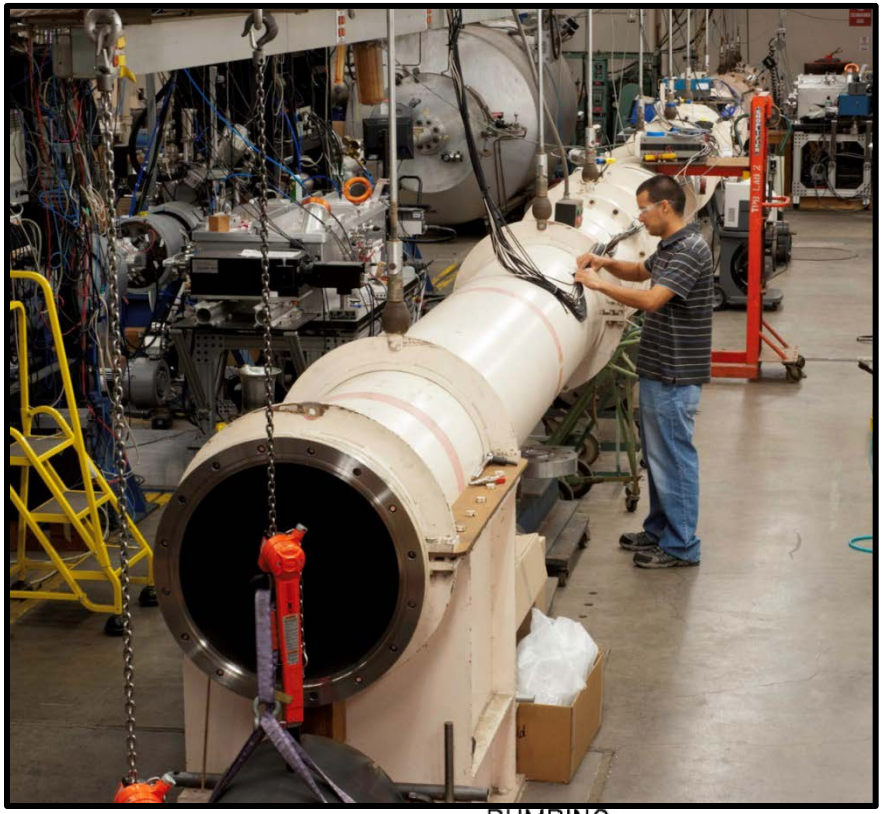
Hypervelocity Free-Flight Aerodynamic Facility
Aero & Aerothermodynamics

Simulates gasdynamics of atmospheric entry. Entry simulation up to 8 km/s is achieved by launching models from high-speed guns into flight tubes containing pre-mixed atmospheric simulants of arbitrary composition and pressure.

Ames Vertical Gun Range
Impact Physics & Cratering

Simulates planetary impact cratering phenomena. The facility utilizes various model launching guns that can achieve impact velocities up to 8 km/sec.

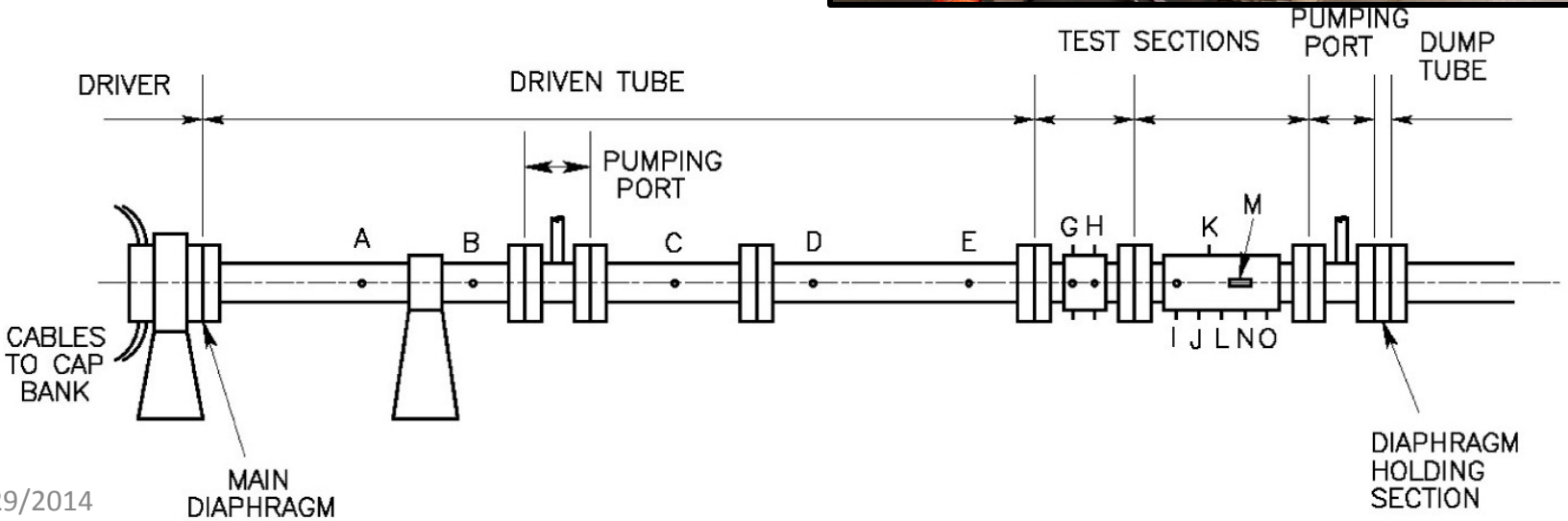
Electric Arc Shock Tube (EAST)



EAST generates high velocity shock waves for the study of optical radiation and ionization entry phenomena. The facility uses test gas mixtures that mimic the atmospheres of various planets.

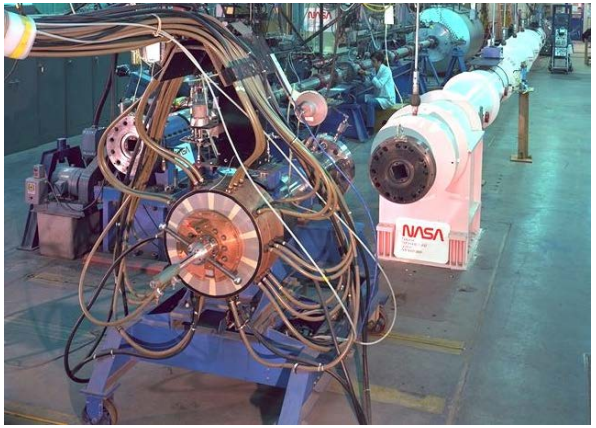
Developed in the mid 1960s; operational in early 1970s
4 inch/24 inch dia. driven tube
Unique capabilities
- Shock speed range (up to 46 km/s)
- Driven gas composition
- Optical instrumentation

Gas kinetics, radiation, ionization studies



Electric Arc Shock Tube (EAST)

Reproduces shock speed, gas composition, pressure
Clean shock with no material surface interference

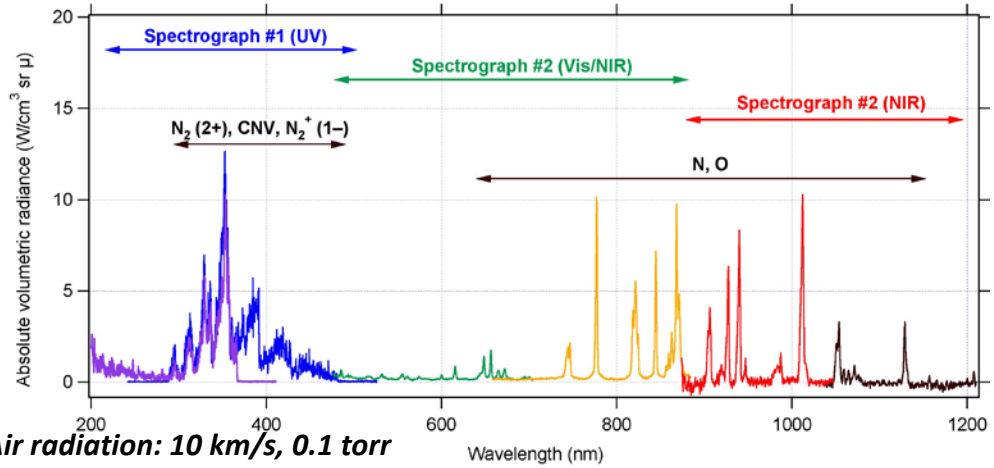


Facility characteristics:

- Versatile shock tube used to generate shock-heated gas conditions experienced by planetary entry vehicles
- High power electric arc driver
- 4” dia. Aluminum driven tube/ 24” steel driven tube
- Oil-free high vacuum pumps to minimize test gas contamination

Research projects

- Test programs to investigate shock layer radiation and its potential contribution to planetary entry vehicle heat transfer
  - Earth: Orion lunar return
  - Mars: Aerocapture
  - Titan: Huygens entry; aerocapture



Air radiation: 10 km/s, 0.1 torr

Facility capabilities and instrumentation

- Shock speeds from 3 km/s to 46 km/s
- Gas kinetics, radiation, and ionization studies
- Imaging spectroscopy instrumentation for spatial and spectral measurements of shock layer radiation from the near infrared through the vacuum ultraviolet
- High-resolution shock speed measurement instrumentation

Facility WWW Site:
http://thermo-physics.arc.nasa.gov

Hypersonic Free Flight Facility

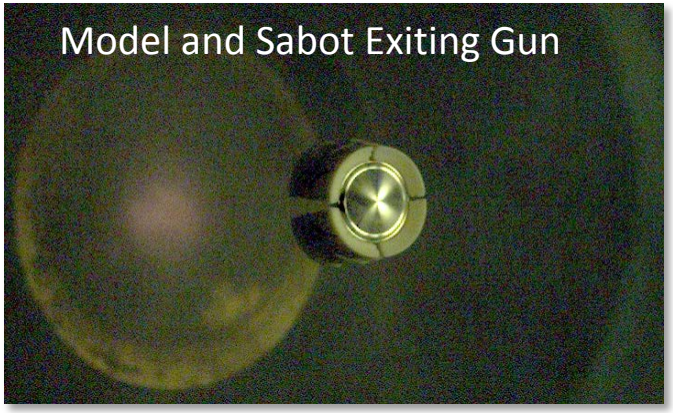
Sealed, Variable Pressure Flight Tube
Variable Launch Velocities

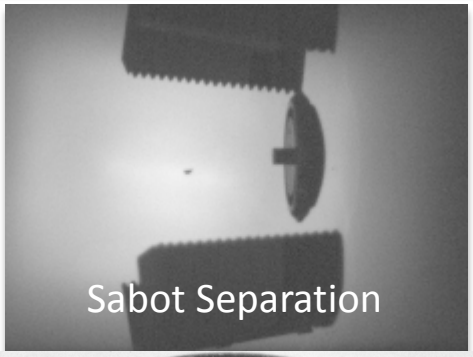
PERFORMANCE SUMMARY:

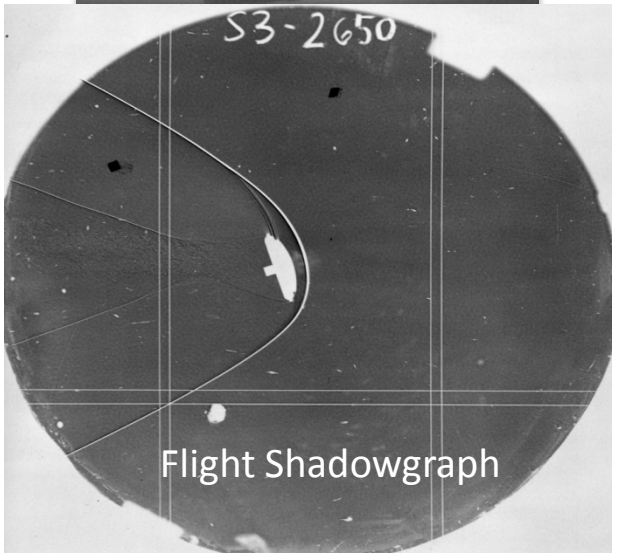
• Light-gas Guns caliber	.28, .50, 1.00 and 1.50
• Powder Guns	20, 25, 44, and 61 mm
• Velocity	0.2 to 8 km/sec
• Max. Reynolds Number	2×10^6 1/ft
• Model Acceleration	1.5×10^6 g
• Model Mass	0.005 to 0.1 kg
• Test Gas	Air, N_2, CO_2, arbitrary
• Pressure/Temperature	0.03 - 760 torr/Ambient
• Sabot Separation	Aerodynamic

TEST SECTION DIMENSIONS:

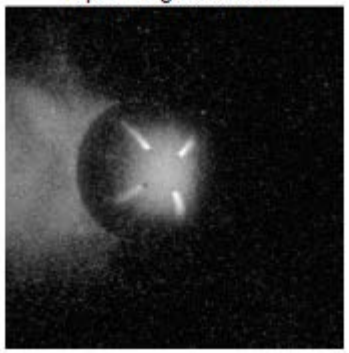
• Length	75 ft. (22.8 m)
• Diameter	3.5 ft. (1.1 m)



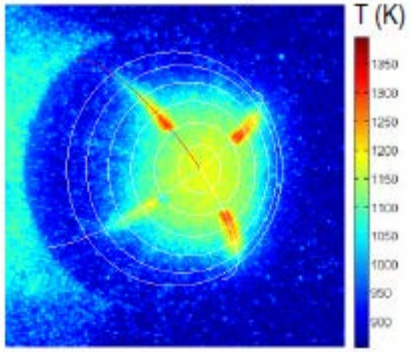




.5µs Image of Model



Thermal Image



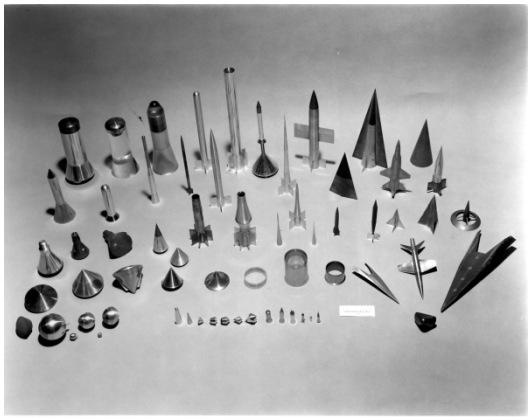
Hypervelocity Free-Flight Aerodynamic Facility

HFFAF Data Gathering Systems:

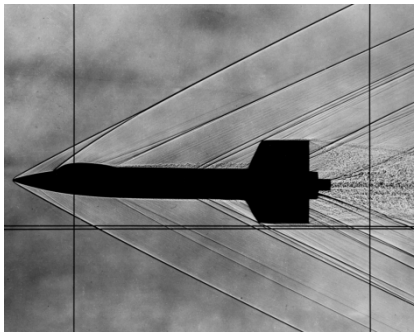
Trajectory & Aerodynamic Coefficients:

Type:	Focused shadowgraph (film-based)
Light Source:	Spark gap (capacitive discharge)
Shuttering:	Kerr cell (electro-optical), 40 ns exposure
Model Detection:	Photomultiplier-tube/halogen light sheet

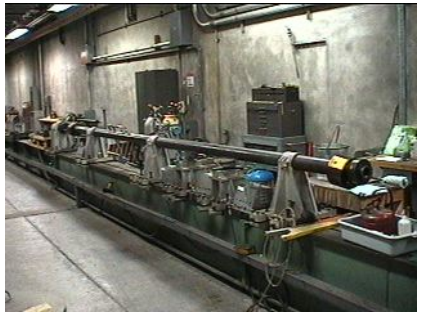
Aeroballistic Models



Shadowgraph Image



Model Launching Gun
(Light-Gas & Powder)



Sabot Separation Tank

Test Section
(Shadowgraph Stations)

Test Section
(Interior)

Ames Vertical Gun Range (AVGR)

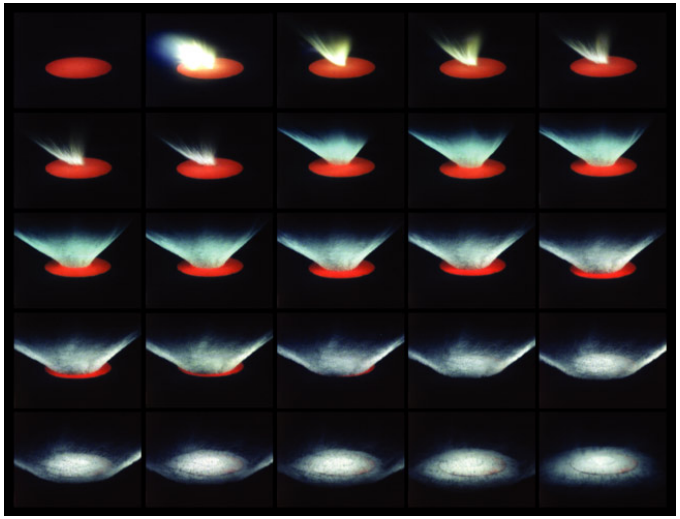
PRIMARY SPONSOR: SMD, Planetary Geology and Geophysics (PGG)
STATUS: Operational (Commissioned 1966)
LOCATION: N-204A
PERFORMANCE SUMMARY:

- Projectile speed — 0.5 to 8.0 km/sec
- Projectile size — 2mm to 7.6 mm
- Projectile geometry — sphere, cylinder, irregular shapes
- Projectile composition — metallic, plastic, glass, mineral
- Test section environment — variable (Air, CO2, etc.)
- Test section pressure — 0.04 to 760 torr
- Test section temperature — Ambient

TEST CHAMBER DIMENSIONS:

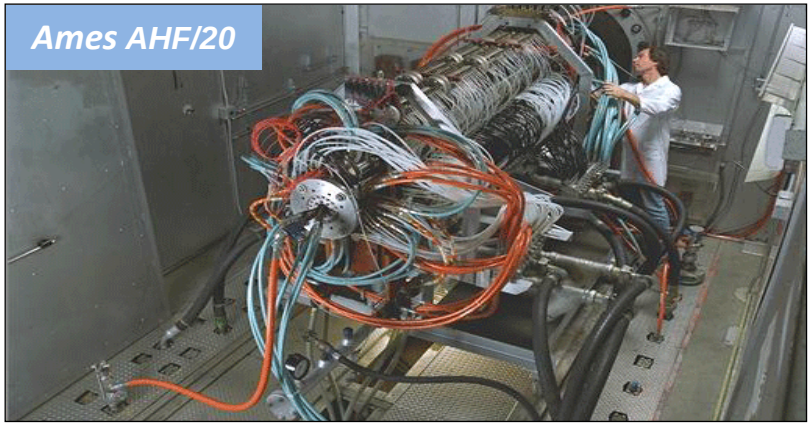
- Diameter — 2.5 m
- Height — 2.5 m
- Volume — 14 m^3

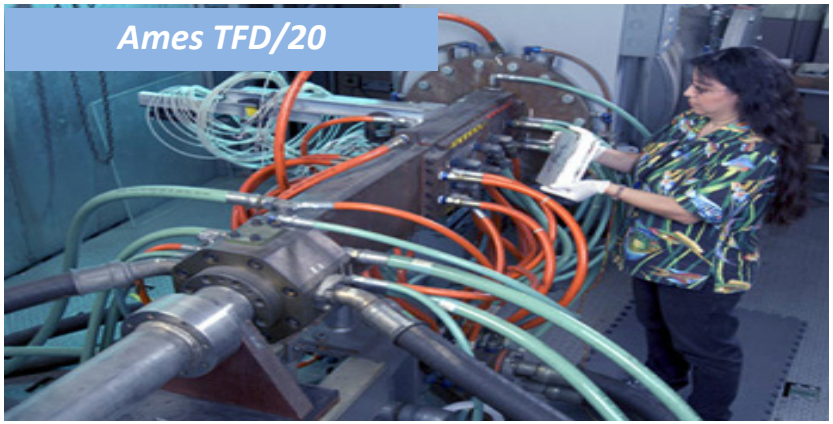
Ejecta Dispersion Analysis and Capture



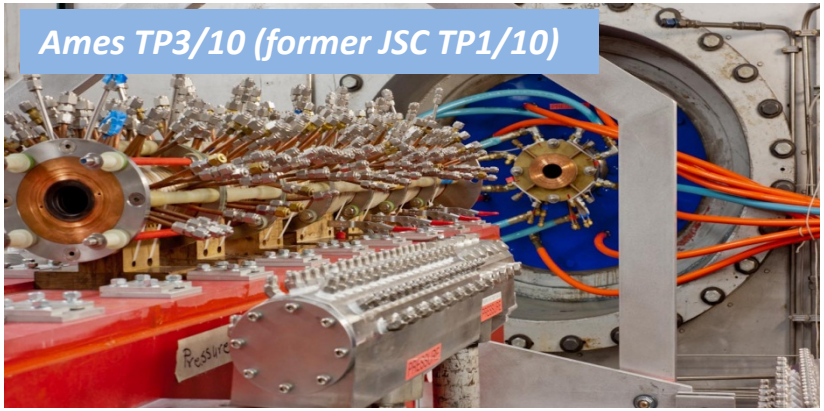
The AVGR simulates the physics and mechanics of planetary impact cratering phenomena. The facility utilizes various model-launching guns that can achieve impact velocities up to 8 km/sec. The angle of elevation of the gun with respect to the horizontal plane can be varied in 15° increments from 0° to 90°, thus permitting oblique angles of impact with respect to the gravitational vector. The large impact chamber can accommodate sizable targets and allows for testing at sub-atmospheric pressures and in gases other than air. Primary instrumentation consists of a diverse suite of state-of-the-art, high-speed imaging systems (i.e. pairs of Phantom V10, V12 and Shimadzu cameras) that can record the cratering processes with tremendous detail. In addition, spectroscopy and other forms of instrumentation can be accommodated.

NASA Ames Arc Jet Facilities



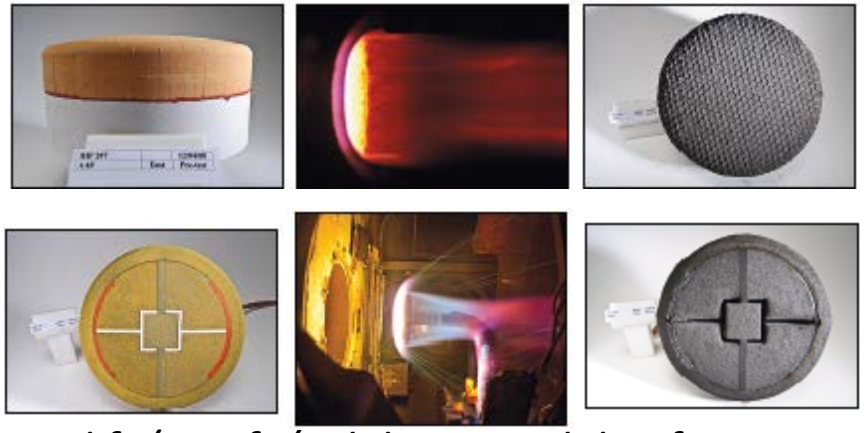


Unique national capability, essential for developing, qualifying, and sustaining any vehicle program with atmospheric entry phase



Rationale for Arc Jet Testing: TPS DDT&E, TRL 1-9

Long duration, controllable, reproducible ground test platform for simulating hypersonic entry environments

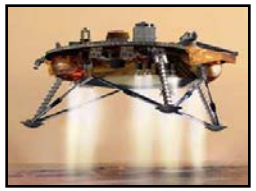


TPS R&D: *provide critical data for the development of thermal protection system (TPS) materials and techniques*

Flight Qualification/Sustaining Engineering: *qualify/certify/validate suitability for flight of TPS materials and processes for National Programs; support updates to manufacturing processes*

APOLLO

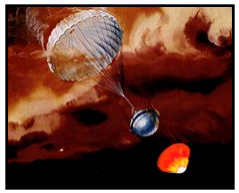
SPACE SHUTTLE



PHOENIX

MSL

Orion



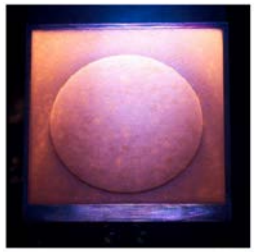
GALILEO

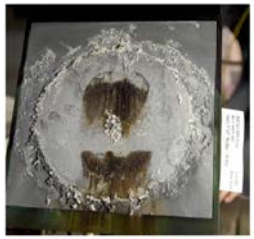
STARDUST

MARS PATHFINDER

MER

DoD



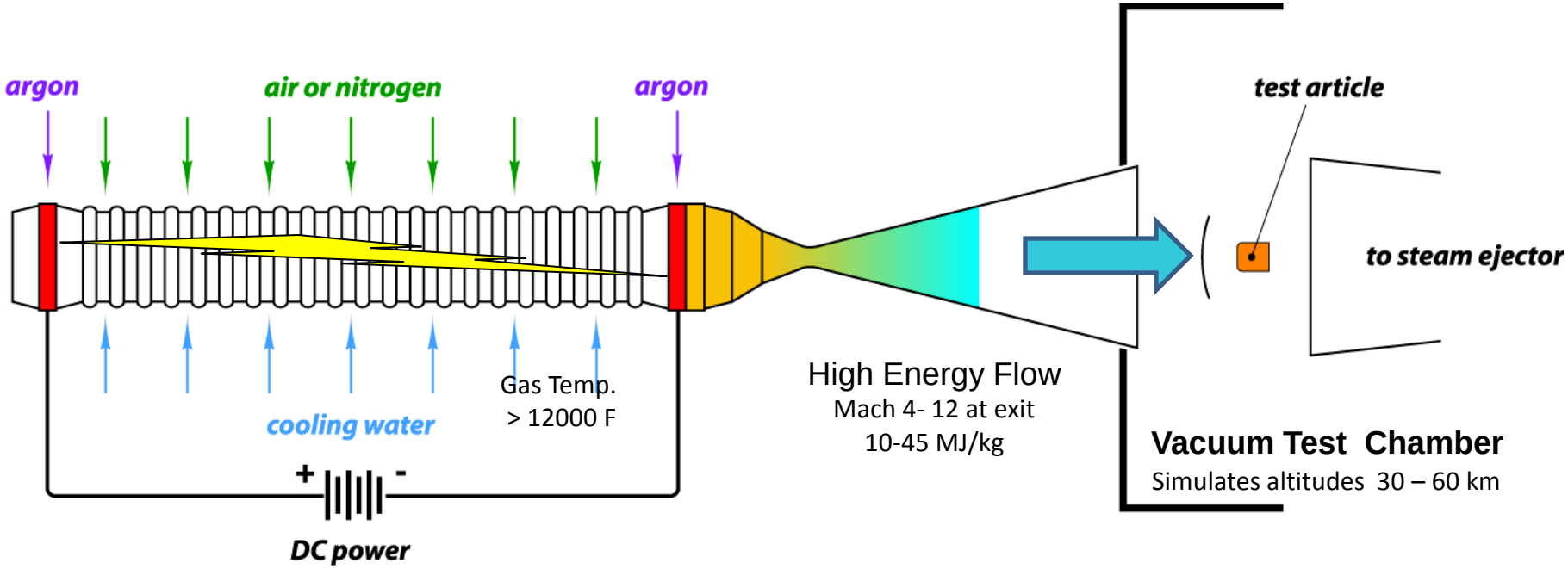


Space Operations/Contingencies: *Support TPS damage assessment and repair technique verification*

Arc Jet Schematic

Objectives:

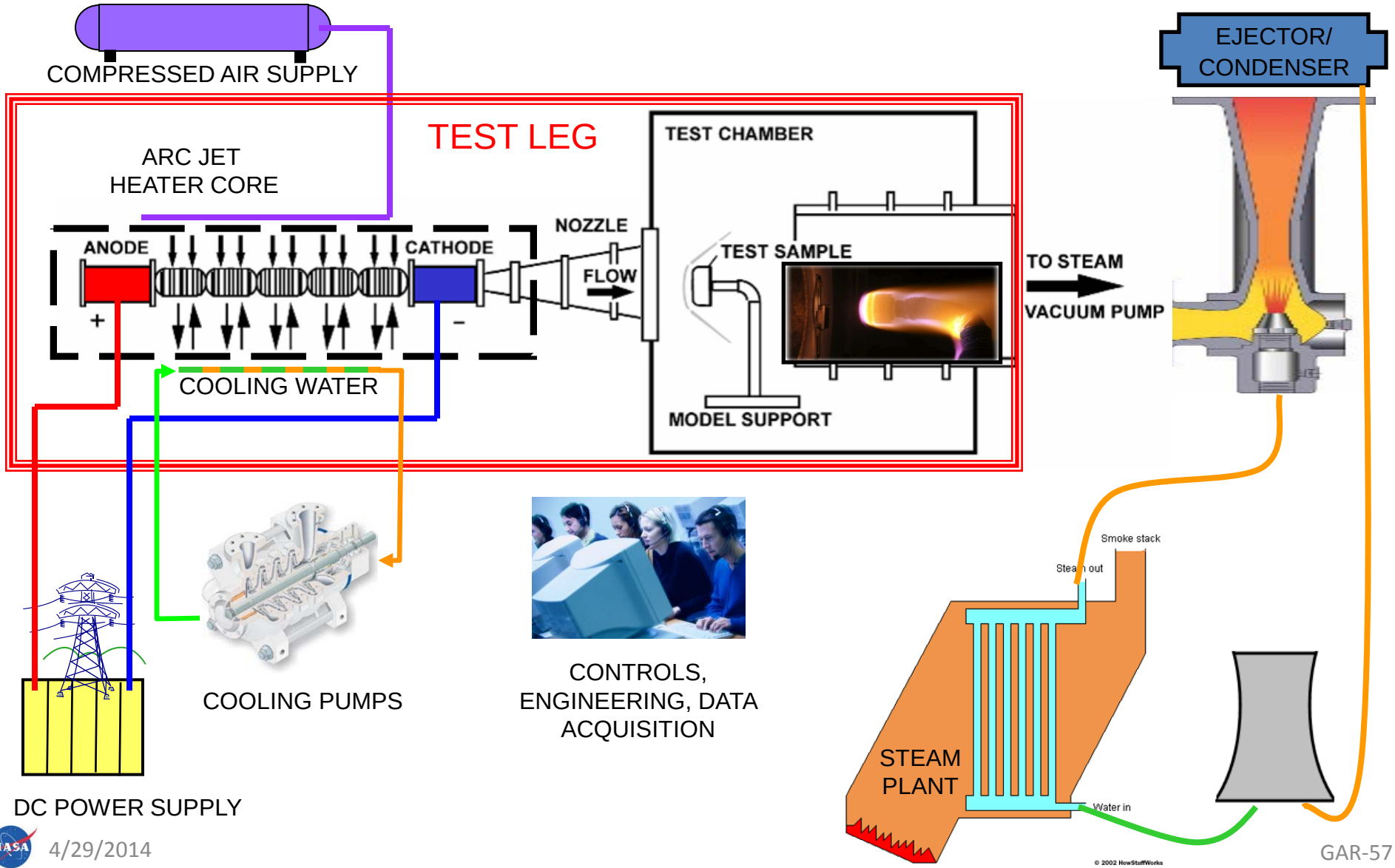
- **Simulate entry heating in a ground-test facility with flight-like chemical, physical, shock flow phenomena, for duration comparable to flight heating pulse**
- **Provide test data to verify thermal protection concepts, materials, and system designs before flight; support continuing engineering during operations**



Method: Heat a test gas (air) to plasma temperatures with an electric arc, then accelerate to hypersonic velocity and direct onto a stationary test article

Arc Jet Facility Components

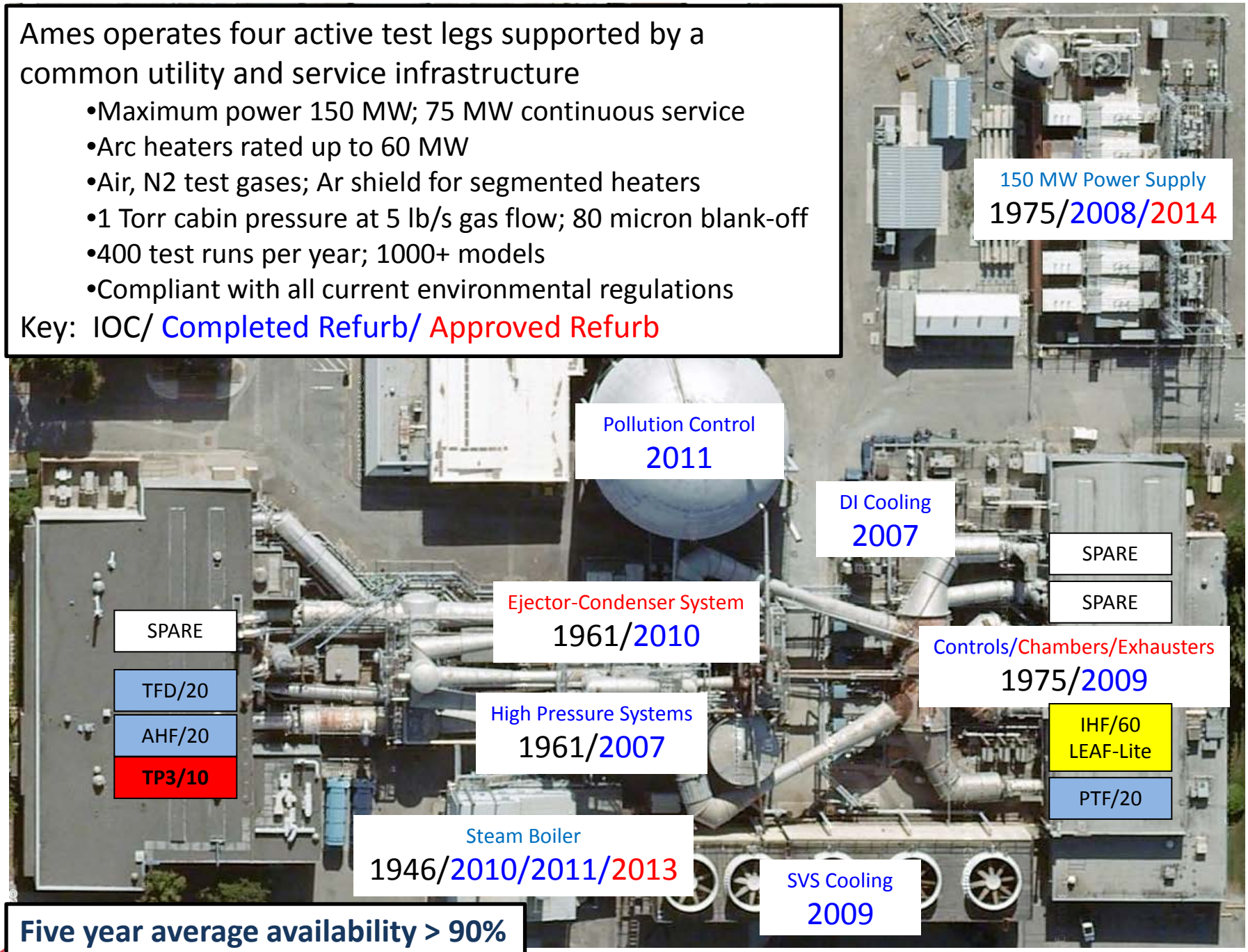
EACH ARC JET LEG IS SUPPORTED BY COMMON FACILITY INFRASTRUCTURE



Ames operates four active test legs supported by a common utility and service infrastructure

- Maximum power 150 MW; 75 MW continuous service
- Arc heaters rated up to 60 MW
- Air, N2 test gases; Ar shield for segmented heaters
- 1 Torr cabin pressure at 5 lb/s gas flow; 80 micron blank-off
- 400 test runs per year; 1000+ models
- Compliant with all current environmental regulations

Key: IOC/ Completed Refurb/ Approved Refurb



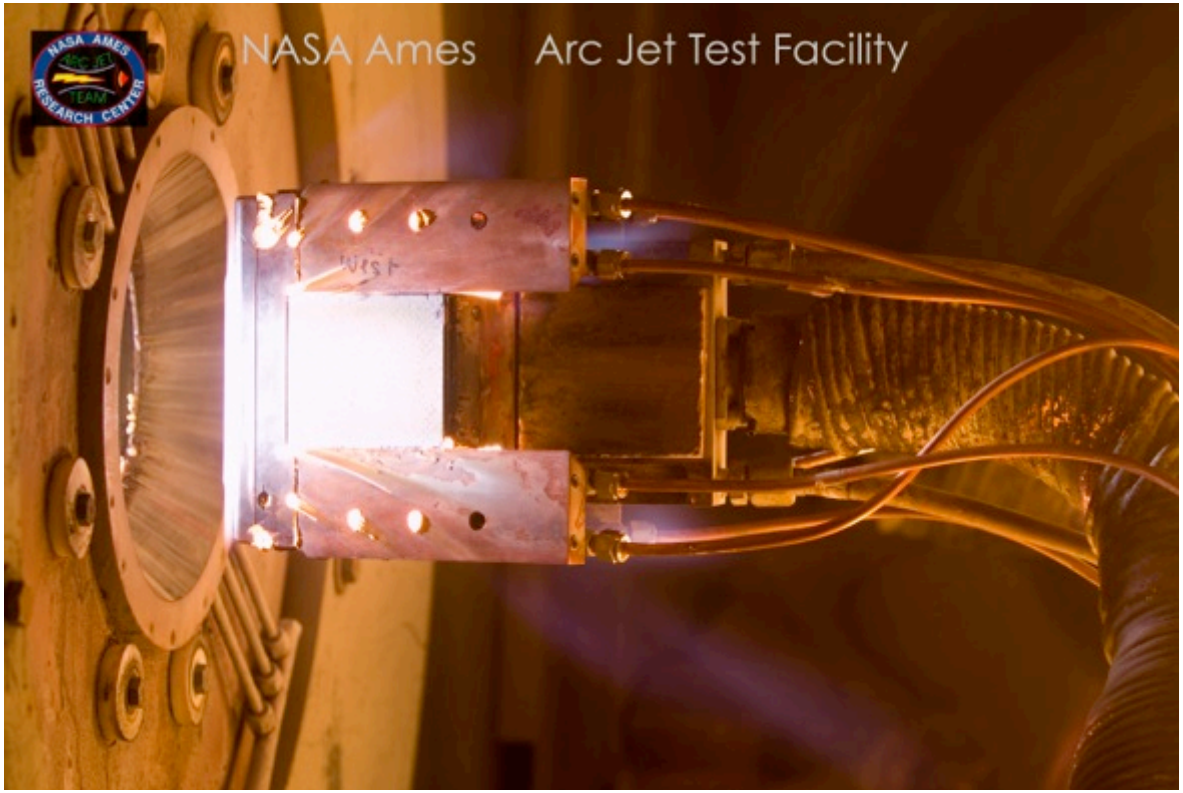
Five year average availability > 90%

Recent Authorized Arc Jet Refurbishment / Upgrade Projects

Project	PY	Cost (K$)	Fund Source
Arc Heater Cooling DI Water Recirculation Pumps	2007	900	CoF
HV Power Supply Rectifiers/Control Systems	2008	1490	CoF
Instrument Air Compressors/Storage/Controls	2008	500	IE/SCAP
Physical Security Upgrades	2009	275	IE/SCAP
Cooling Tower Replacement	2009	4800	CoF
Redundant High-Pressure Air Compressors	2009	500	IE/SCAP
PTF Nozzle/Test Chamber Upgrade	2009	550	Direct CEV TPS
IHF/PTF Control Systems Modernization	2009	1035	CoF
IHF Model Insertion System	2010	2400	IE/SCAP
SVS Vacuum Ejector/Boiler Control System	2010	2000	CoF
SVS Boiler Feedwater/De-Aerator Tank	2011	4300	CoF
Wastewater Recovery/Treatment Facility	2011	2400	SII
Arc Heater NOx Scrubber System	2011	3700	CoF
Arc Jet Consolidation	2012	5800	Direct OSI/SCAP
High Heating Nozzle	2012	500	Direct Outer Planets Pgm
SVS Steam Boiler	2013	32100	CoF
150 MW Rectifier Module Upgrades	2014	5400	CoF
Lunar Environments Arcjet Facility (LEAF-Lite)	2014	16800	Direct CoF- MPCV

In past five years, $75.4M in reliability and tech capability upgrades

Summary

TSF facilities are unique high-energy platforms for simulation of important chemical physics phenomena associated with hypervelocity atmospheric entry. We operate these facilities for government and commercial customers.

- **The facilities operate at high energy densities and at high pressures.**
- **Most of our equipment is unique and of advanced age.**
- **Safe, efficient operation is our top priority.**
- **We anticipate high occupancy for the foreseeable future.**