



# NASA Glenn Research Center Site Visit IT Infrastructure Integration Program (I<sup>3</sup>P)

Office of the Chief Information Officer

May 7, 2009

VISION: Integrated, secure, and efficient information technology and solutions that support NASA



# Agenda

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- 7:00 a.m. – 8:30 a.m. Check-In
- 8:30 a.m. – 8:35 a.m. Logistics Information – Shanton V. Bland, GRC I<sup>3</sup>P Interface Rep.
- 8:35 a.m. – 8:45 a.m. Welcome & GRC Overview – Dr. Woodrow Whitlow, Jr., Center Director
- 8:45 a.m. – 8:55 a.m. I<sup>3</sup>P Overview - Dr. Sasi K. Pillay, GRC Chief Information Officer

## **Center IT Infrastructure Today (Part I)**

- 8:55 a.m. – 9:05 a.m. End User Services – William Naiman
- 9:05 a.m. – 9:35 a.m. GRC Networks – Michael Heryak
- 9:35 a.m. – 9:45 a.m. IT Security – Brenda Ellis
- 9:45 a.m. – 10:00 a.m. BREAK (15 Min.)

## **Center IT Infrastructure Today (Part II)**

- 10:00 a.m. – 10:10 a.m. Code R Environment – Ricaurte Chock
- 10:10 a.m. – 10:20 a.m. Code D Environment – Robert Zalewski
- 10:20 a.m. – 10:30 a.m. Plum Brook Station – Boyd Vance
- 10:30 a.m. – 10:45 a.m. Board Buses/Depart for GRC Campus Tour



# Logistics Information

- Bathrooms
  - Ladies Room
    - Hallway on right
    - Downstairs, follow signs
  - Men's Room
    - Hallway on left
    - Downstairs, follow signs
- I3P Visitor Badges
  - Please keep your badge visible at all times.
- Fire Exits
- Cell Phones Off
  - During presentations
- No Cameras or Recording Devices
  - During presentations
  - During tours
- GRC Questions with the Chief Information Officer
  - Presentations posted on I3P Web Site
  - Use same Q&A system
    - Tied to specific RFP
    - General question
    - Site-specific to POC



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# ***I<sup>3</sup>P Overview***

***Dr. Sasi K. Pillay***  
***Chief Information Officer***



## I<sup>3</sup>P Overview: Why I<sup>3</sup>P?

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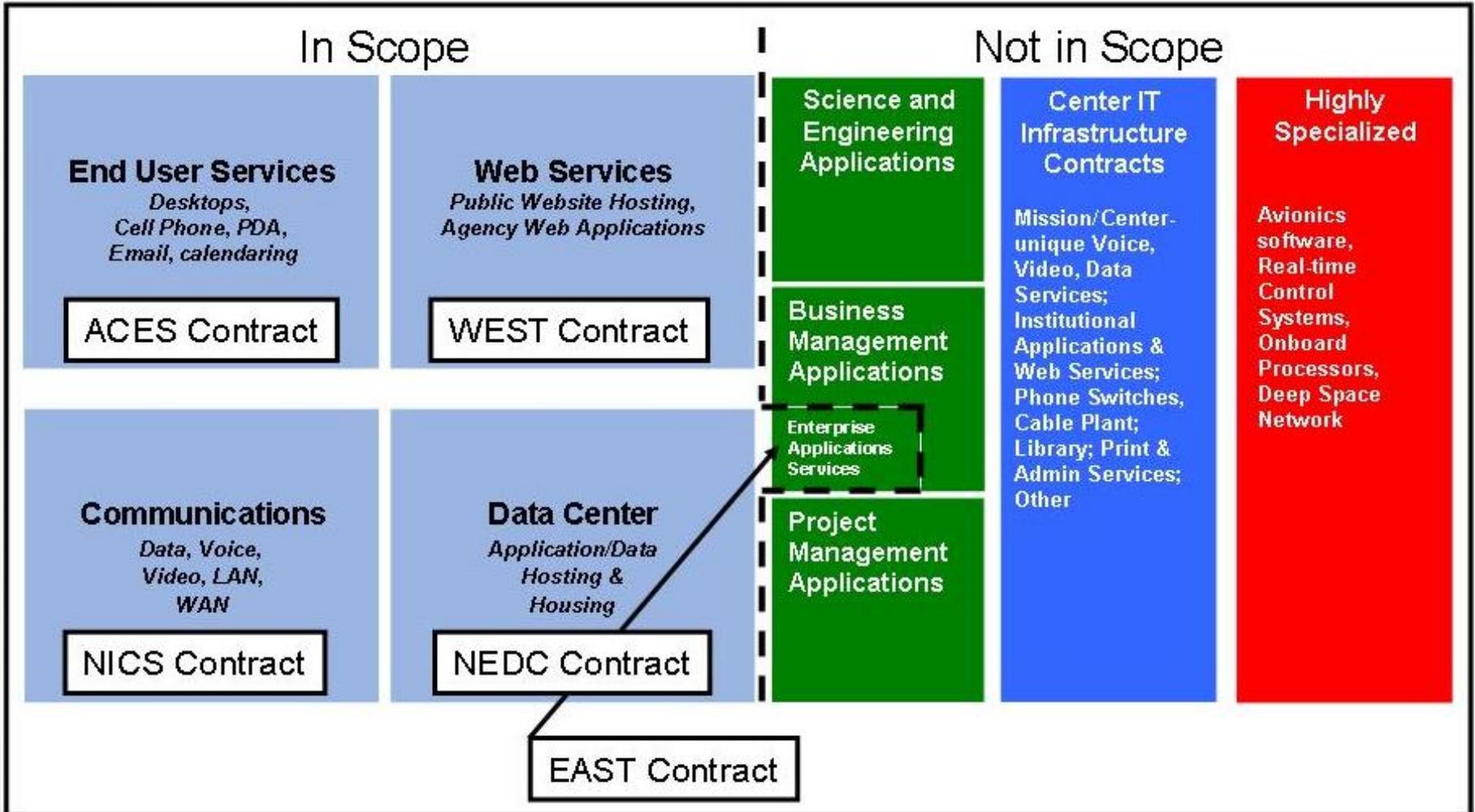
- NASA's commitment to the strategy of Agency-wide IT services and Agency-wide procurement aligns with:
  - Enabling NASA's mission by improving IT security, efficiency, and collaboration
  - Industry and business best practices
  - New Administration's priorities of effectiveness, efficiency, transparency, participation and collaboration
- What will success look like?
  - Reliable, efficient, secure, and well-managed IT infrastructure that customers rely on
  - Support collaboration with ease
  - Systems seamlessly deployed and used across Centers
  - Investing in the right IT solutions that provide the greatest benefit to the NASA mission





# I<sup>3</sup>P Overview: Five Procurements Drive NASA's IT Transformation

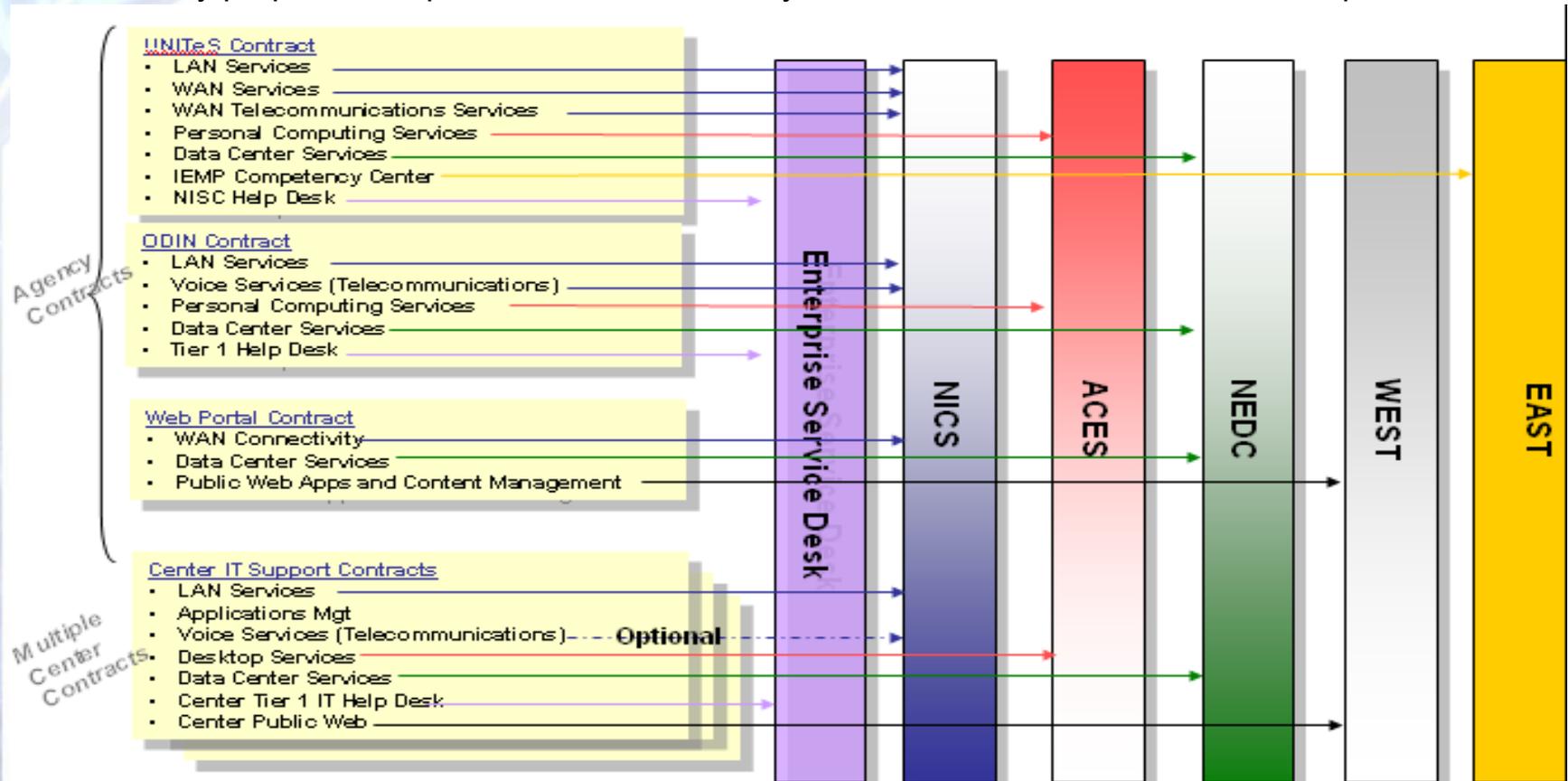
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# I<sup>3</sup>P Overview: Agency IT Infrastructure Supports Transformation

- Consolidates and requires Centers to use Agency contracts for core IT infrastructure services
- Allows Centers to use Center specific IT support contracts for Non-I<sup>3</sup>P services
- Uses a single Enterprise Service Desk and Enterprise Service Request System for reporting/tracking Incidents and for requesting I<sup>3</sup>P defined services
- Primary purpose is to provide better IT security, collaboration, efficiencies to accomplish NASA mission





# I<sup>3</sup>P Overview: Agency IT Infrastructure Supports Transformation

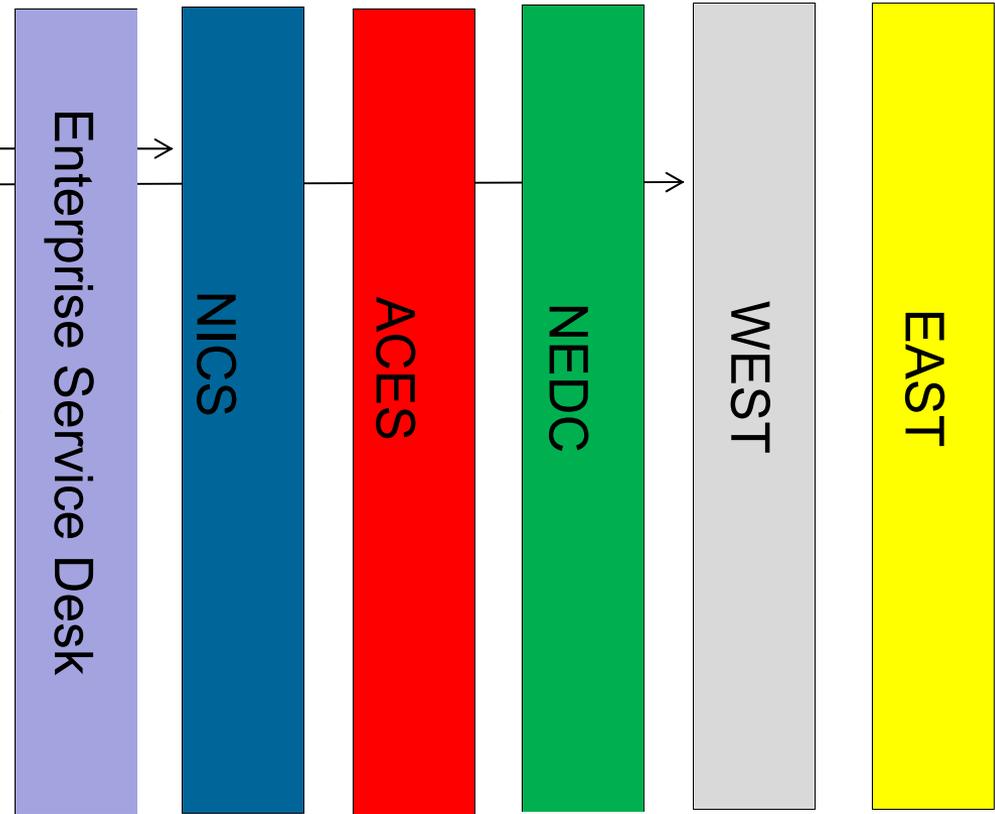
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## PACE Contract (Examples of work that might transition)

- Firewall
- Web Development

## PACE Contract (Examples of work that is not transitioning)

- High Performance Computing Environment
- Data Systems Support
- Specialized Code Development





## I<sup>3</sup>P Overview: Efforts Under Way

- Making NASA's information easier to discover and safely access through current projects (e.g., Security Ops Center)
- Continuing consolidation of NASA's information technology (IT) through current contracts and projects (e.g., ODIN, NOMAD)
- Working procurements for Agency-wide IT services:
  - **NICS** will integrate networks and provide seamless operations across Centers;
  - **NEDC** will improve availability and access to applications and data;
  - **WEST** will improve the quality of web services for the same cost;
  - **ACES** will provide a consistent level of IT services across NASA; and
  - **EAST** will enable more efficient development and maintenance of Agency-wide applications, as well as improve the availability of business information for better informed decision making.
  - Enterprise Service Desk at NSSC will provide a single point of contact for IT incident and problem resolution and I<sup>3</sup>P service ordering



# I<sup>3</sup>P Overview: Procurement Schedule

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Updated April 20, 2009

| <b>Milestones</b>       | <b>NICS</b>  | <b>ACES</b>      | <b>NEDC</b>      | <b>WEST</b>      | <b>EAST</b>      |
|-------------------------|--|------------------|------------------|------------------|------------------|
| <b>Draft RFP</b>        | 4/20/09  | 4/20/09          | 4/20/09          | 4/20/09          | 5/11/09          |
| <b>Industry Days</b>    | 4/21 and<br>4/22   | 4/21 and<br>4/22 | 4/21 and<br>4/22 | 4/21 and<br>4/22 | 4/21 and<br>4/22 |
| <b>Due Diligence</b>    | 5/1 to 5/15 – Primary focus is on ACES, NEDC and NICS.<br>NOTE: The EAST site visit will be on 5-20 at MSFC. |                  |                  |                  |                  |
| <b>RFP Release *</b>    | 6/15/2009  | 6/15/2009        | 6/15/2009        | 6/15/2009        | 6/15/2009        |
| <b>Proposals Due *</b>  | 7/30/2009  | 7/30/2009        | 7/30/2009        | 7/30/2009        | 7/30/2009        |
| <b>Contract Start *</b> | May 2010   | June 2010        | May 2010         | June 2010        | May 2010         |

\* Dates reflect current schedule posted online.



# Site Visit Objectives

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- What we are planning to do
  - Explain the Center: facilities & people (who we are)
  - Explain involvement with major programs, projects, and missions (what we do)
  - Explain the current state of IT infrastructure at the Center
    - End-user services (desktop/laptop/workstations)
    - Communications (networks, phones)
    - Data centers
- What we are NOT planning to do
  - Explain further the five I<sup>3</sup>P acquisitions or associated strategy
  - Explain the content of the draft RFPs
  - Entertain questions on the acquisition strategy or draft RFPs
  - Discuss future state/plans for Center IT infrastructure



# ***GRC***

# ***End User Environment***

***Presenter: William Naiman***



## End User Services- General

- 20-plus years of highly centralized networking and end user services at GRC
- Recent 10 years with ODIN has leveraged the full services to the fullest extent possible. Provides comprehensive services to the Center
- ODIN services acquired by business organizations via 46 organizational based Points Of Contact (POC)
- ODIN model services provided to 4 additional local groups via independent agreements directly with the current ODIN service provider
- The remote site Plum Brook Station is treated as an extension of the GRC campus



## End User Services- General

- Standardized NASA image software loads (STD 2804)
- Standardized GRC specific software overlay to NASA image (Glenn unique)
- Single standardized Windows domain environment
- New computer baseline hardware updated quarterly (STD 2805)
- Management tools
  - Systems Management Server (SMS)
  - Windows Software Update Server (WSUS)
  - Apple Remote Desktop
  - LanRev





## Services Provided

- Integrated Network Print Service (~225 print queues)
- Network File Storage (individual and workgroups)
  - Redirected “My Documents” or Macintosh EFS share
  - Shared storage and secure shared storage using Decru appliance
- Network based Backup Service
  - Tivoli agents on all client systems
- Centralized Web hosting (Intranet and Internet)
  - Official Glenn “corporate” site(s)
- Centralized FTP Services (Intranet and Internet)



# Services Provided

- Centralized News Reader Service
  - Usenet news server management
- Centralized Citrix Server Service
  - Supports remote access users
  - Supports Macintosh users needing Windows functionality
  - Supports Unix users needing Windows functionality
- NOMAD based E-mail Service
- WebEx Web Conferencing Service
  - User based subscription to service available for small to very large volume of conferencing minutes
- Centralized Help Desk (single call center for user community with seamless pass-through to the alternate support desks )



## Services Provided

- Security plan management (Desktops, Network, Servers, and Telecom)
- Dedicated System Administrators (~8 )
  - Providing “resident” support
- Seat Evaluation Lab - computer showroom and organizational testing of applications or hardware
- PKI Entrust Registration Authority management
- Commercial Catalog Service
  - Web based purchase of hardware, software, and services
  - Virtual Storefront for quick delivery of common items
  - Acquisition transaction using Bank Card or Purchase Request
  - Special or unique one-time needs furnished using Infrastructure Upgrade Proposal (IUP)



# Services Provided

- Privileged user account management
  - System level privilege (administrative account rights) requests can be granted via formal request and approval process
- Laptop Loaner Pool management
  - Pool of 10 laptops available for 2 week loan periods
- Cellular Wireless Network Router Pool management
  - Pool of 10 EVDO devices available for 2 week loan periods



## Services Provided

- User self service software installs for ODIN provided PC and Macintosh systems using a web based Software Refresh Portal (SRP)
- Patch deployment and antivirus distribution to non-ODIN network computers
- Take Home Software
  - Microsoft Office for PC and Macintosh
  - Symantec Antivirus
- Patchlink asset inventory and FDCC reporting

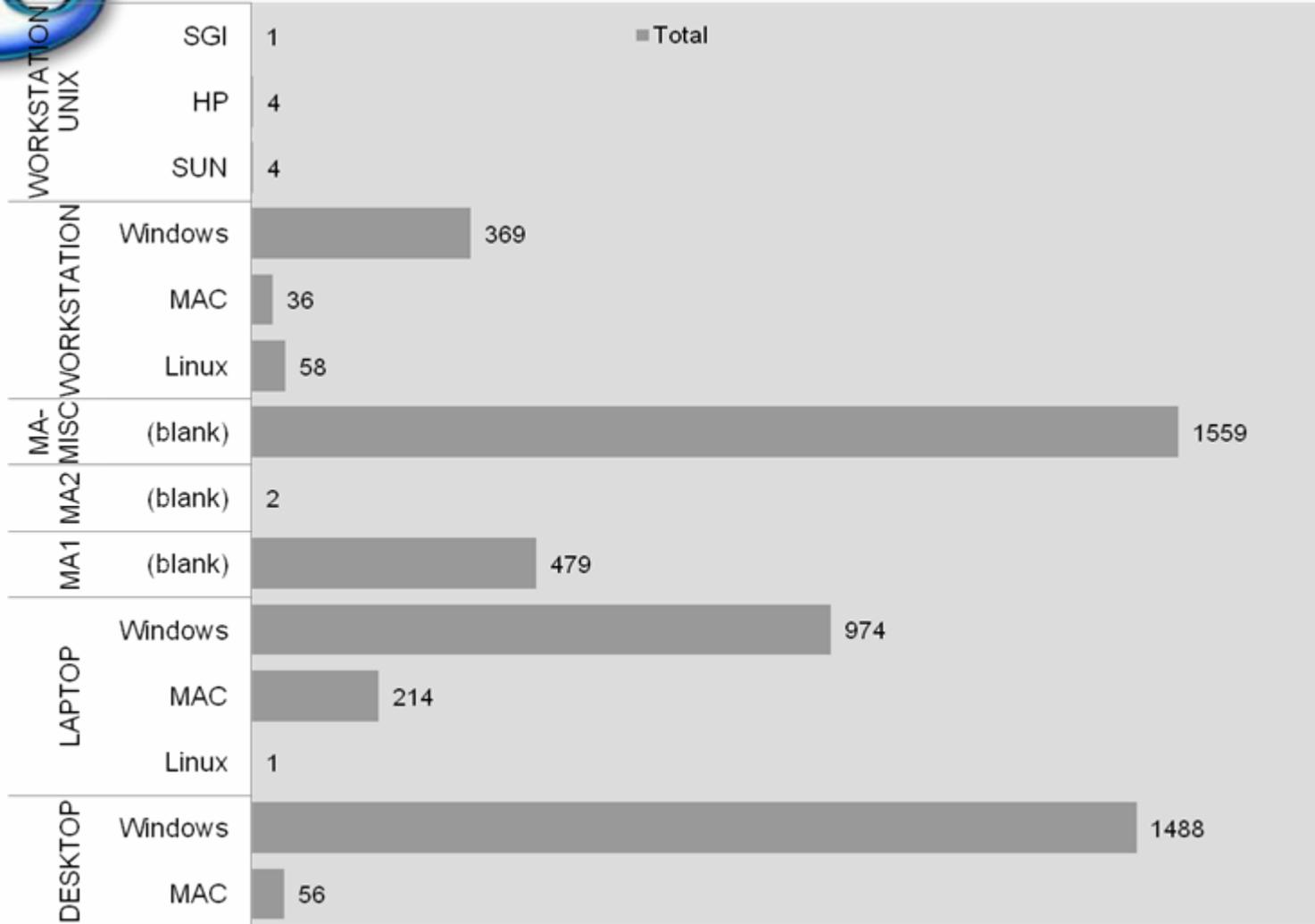


## SEAT TYPES AT GRC

- Desktop
- Laptop
- Workstation
- Workstation UNIX
- NAD (Networked Attached Device)
- MA1/MA2/MA-MISC (Maintenance Only)
- Account Services
- Server (APP1, FILE1, WEB1, SERV1, SERV2)
- FAX
- VTM (Virtual Team Meeting – WEBEX)
- LAN (Local area network)
- ARCH1 – Archival Seat
- Phone Seats



# Center Desktop Distribution



MA-Misc= hardware maintenance of peripherals  
 MA2=hardware maintenance of UNIX based computers  
 MA1=hardware maintenance of PC and Macintosh computers





# ***GRC***

# ***Communication Environment***

***Presenter: Michael Heryak***



# Agenda

- Network
  - GRC Local Area Network (LAN)
  - Cable Plant
  - Wireless LAN
  - Wide Area Network (WAN) and Firewall covered by IT Security
- Telephone System
- Video Distribution System
- Video Conferencing
- Radio System

*Known technical considerations are indentified at the end of each section*



# GRC Network

- Backbone
  - (4) Cisco 6509E with dual Sup720's
  - Fully meshed switched 10GigE
- Building Local Area Networks (LANs)
  - 80% Cat 5/5E Switched 10/100/1000 (Cisco switches)
  - Balance shared 10Mb coax or Cat 3 or 4 (Cabletron, DEC, others)
  - Most buildings served by single and multimode fiber
- Wireless LAN
  - Based on 802.11g Cisco model 1200 access points
  - Coverage
    - Installed in 25+ Buildings at Lewis Field
    - Installed in one Building at Plum Brook
  - Two-factor authentication to access GRC internal network
  - Unsecured & unencrypted guest wireless access
- Plum Brook
  - Cisco 6500 functions as a distribution router
    - Connected to Lewis Field via a DS-3
  - Building LANs vary widely



# GRC Network (Con't)

- Network Facilities
  - Glenn Network Operations Center (GNOC)
  - Wide Area Network (WAN) Gateway
    - NASA Integrated Services Network (NISN)
    - Firewall
    - Telco demarcation
    - Planning to relocate
  - Communication rooms
    - Often shared with other equipment
    - Level of security varies
- Underground Manhole System
  - Managed under a partnership with GRC Facilities Division
  - Fiber, coax, copper
  - Shared with protective signaling cable
  - Plum Brook cable is either overhead or direct buried



# GRC Network Upgrade

- Phase I – Replace obsolete network switches in key buildings
  - Complete May 2009
- Phase II – Replace Network Backbone and Increase Speed from Gigabit to 10 Gigabit
  - Complete May 2009
- Phase III - Replace obsolete cable and continue replacement of obsolete network hardware
  - In project formulation phase
- Phase IV – Alignment with Agency Network Architecture
  - Network Consolidation Initiative (NCI)
  - Center Zoned Architecture Project (CZAP)
- Additional phases under development



# GRC Network

- Known GRC Network Considerations
  - Local Area Network (LAN) cabling in some areas needs to be replaced and/or augmented
  - Fiber shortages
  - Communications room physical space HVAC, power, physical security
  - Underground manholes
    - Diminishing duct space
    - Deteriorating racking
    - Drainage
  - Documentation needs updating



# GRC Telephone System

- Lewis Field PBX
  - Fujitsu F9600XL
    - 3984 Analog Lines
    - 1584 Digital Lines
  - System Software Fujitsu Release 15
  - Battery and Natural Gas Generator UPS
  - External Interfaces
    - (6) ISDN PRI Lines for DOD/DID
    - (4) T-1 Lines for FTS Access
    - (10) T-1 Lines DID from local 977 exchange
    - (2) T-1 Lines to Aerospace Technology Park (ATP)
    - (2) 4-wire E & M trunks to Ohio Aerospace Institute PBX
    - (2) T-1 to Meeting Place Teleconference System
    - (1) PRI to Sister PBX at Plum Brook



# PBS Telephone System

- Plum Brook PBX
  - Fujitsu F9600ES
    - 176 Analog Lines
    - 80 Digital Lines
  - System Software Fujitsu Release 15
  - External Interfaces
    - (4) DID trunks
    - (4) DOD trunks
    - (1) PRI to Sister PBX at Lewis Field



# Telephone System (con't)

- Voice Mail
  - AVST CallXpress I-4000 Voice Messaging System
    - Replaced Octel Overture 350 in December 2008
  - Approximately 5000 mailboxes
  - Personalized messages, directory mailboxes, automated attendant, outcalling and paging
  - Serves both Lewis Field and Plum Brook
- Voice Conferencing
  - Cisco Meeting Place 6.0 Conference Server, installed 2007
  - (4) Dedicated T-1 lines
  - Supports up to 96 concurrent participants
  - Toll free access, web browser access



# Telephone System (con't)

- **Known Telephone System Considerations**
  - Switch age (Lewis Field - 1990, Plum Brook - 1997)
    - Replacement parts are hard to come by
    - No further software updates are available from vendor
  - Replacement of switch with newer technology driven by GRC Facilities Master Plan
  - Ongoing need to repair underground telephone splice cases
  - No VOIP deployments at this time



# Video Distribution System

- Commonly Used Names
  - Lewis Information Network (LINK)
  - Glenn Television (GTV)
- Technology
  - CATV analog, 300MHz bandwidth
  - Head-end
    - Distributes to 3 major areas: North, South, West
- Cabling
  - Building-to-building cable is hardline coax
    - Very limited use of fiber
  - Internal building cable is hardline in halls with RG-6 to offices
  - Serves greater than 90% of buildings at Lewis Field
  - Plum Brook receives video over IP using part of DS-3 bandwidth



# Video Distribution System (con't)

- Programming
  - Channels
    - NASA TV (4 channels)
    - Commercial: CNN, Weather Channel, CSPAN 1 and 2
    - Video Bulletin Board
    - Graphics and Visualization (G-VIS) Lab
    - Remaining channels used for internal broadcasts and special events
  - (2) Channels to Plum Brook encoded over IP
  - All channels broadcast in Standard Definition (SD)
  - No High Definition (HD) channels



## Video Distribution System (con't)

- Known LINK/GTV Considerations
  - External coax cable plant at end of life
  - Distribution amplifiers at end of life
  - Noise induced by open terminations on main taps and outlets
  - No HD capability



# Video Conferencing

- Rooms
  - 3 Rooms managed by GRC CIO
    - Equipment in 2 of these rooms maintained by NASA Integrated Services Network (NISN)
  - 5 other rooms managed by organizations outside GRC CIO
    - Most of these rooms are not maintained by NISN
  - Room scheduling outside of I3P scope



# Video Conferencing

- Known Videoconferencing Considerations
  - Aging hardware in some areas creating reliability issues
  - Newer technologies (e.g.; WebEx, HD) creating usability and compatibility problems



# Radio System

- Lewis Field Radios
  - Motorola Astro Digital Radio System (2007)
  - Repeater Located in Building with Generator Backup
  - 25 Base Stations, 200 Portable Units
- Plum Brook Station Radios
  - Multi Agency Radio Communications System (MARCS) used by Life Safety Personnel
    - 20 Portable Units, 5 Mobile Units
  - Legacy 2-channel radios service research and operations
- RF Spectrum Management provided by GRC (Code D)
  - Manages RF equipment at Lewis Field and Plum Brook



# Radio System

- Known Radio Considerations
  - Plum Brook radios are only partially compliant with National Telecommunications Information Administration (NTIA) narrow band frequency mandate



# ***GRC IT Security***

***Presenter: Brenda Ellis***



# Agenda

Office of the Chief Information Officer

- Background
- I<sup>3</sup>P Related Activity



# Program Office

- FISMA
  - Conduct annual FISMA related activities to satisfy OMB requirement to implement, manage, and report IT security controls for 45 systems in inventory.
    - Develop test plans, per NIST 800-53A criteria, for annual assessments. Coordinate testing and develop Security Assessment Reports for Plan Of Actions and Milestones (POA&M) input.
    - Coordinate contingency plan testing and document findings
- Certification & Accreditation (C&A)
  - Facilitate IT Security C&A for 1/3 of systems in inventory each year.
    - Provide system owners and administrators with templates for all C&A related artifacts.
    - Review C&A related artifacts for completeness and correctness.
    - Liaise with independent 3<sup>rd</sup> party assessment teams



# Incident Response

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- Forensics
  - Investigation
    - Work with other Federal Agencies
  - Containment
    - Block or remove infected systems
  - Reporting
    - Internal, Center-wide, Agency
  
- Misuse
  - Inappropriate use of government IT resources
  
- Agency centralized IT Security Operations Center
  - Collaborate efforts with Agency to standardize tracking reporting processes



# Perimeter Security

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- Perimeter Security
  - Agency standardized processes for IT Security network architecture
  
- Perimeter Security Tools
  - Firewall
  - VPN
  - Web Proxy
  - Web Filters
  - Network Monitoring
  - Vulnerability Scanner
  - Intrusion Detection



# IT Security Current Functions

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- Agency Security Update Service (ASUS)
  - This is the reporting mechanism for patch levels across the agency.
  - Includes asset inventory and vulnerability snapshots.
- Remote Authentication
  - Administration and distribution of RSA tokens (2000+).
- Incident Response
  - Block and removal of infected systems

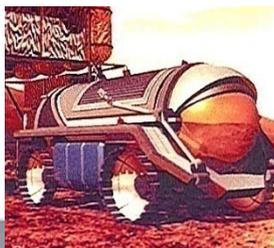
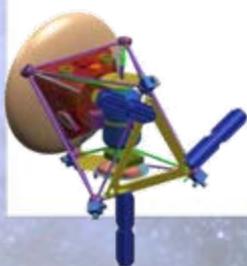


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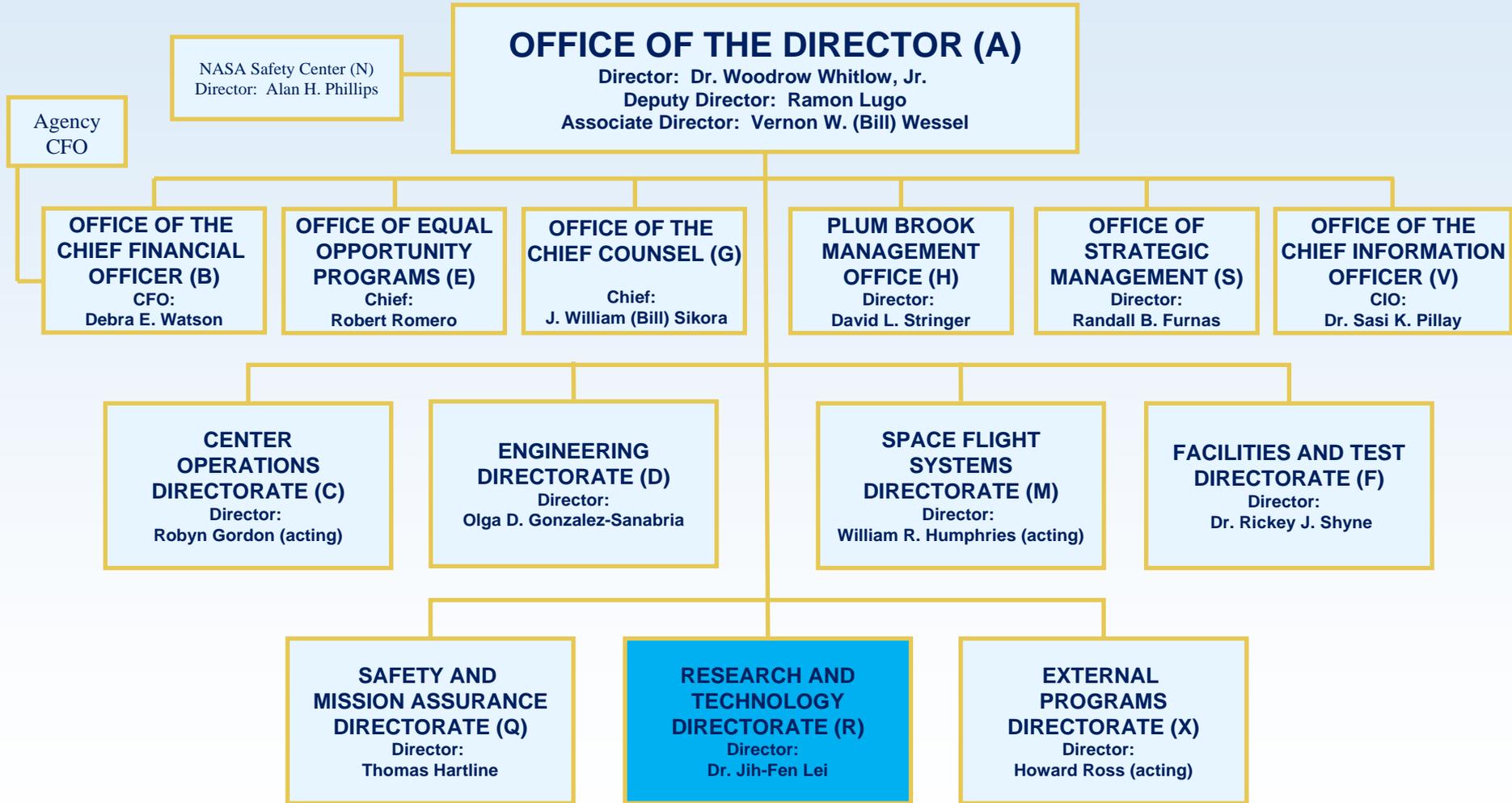
# ***NASA Glenn Research Center***

***Research & Technology Directorate***  
**Code R Environment**

**Presenter: Ricaurte Chock**

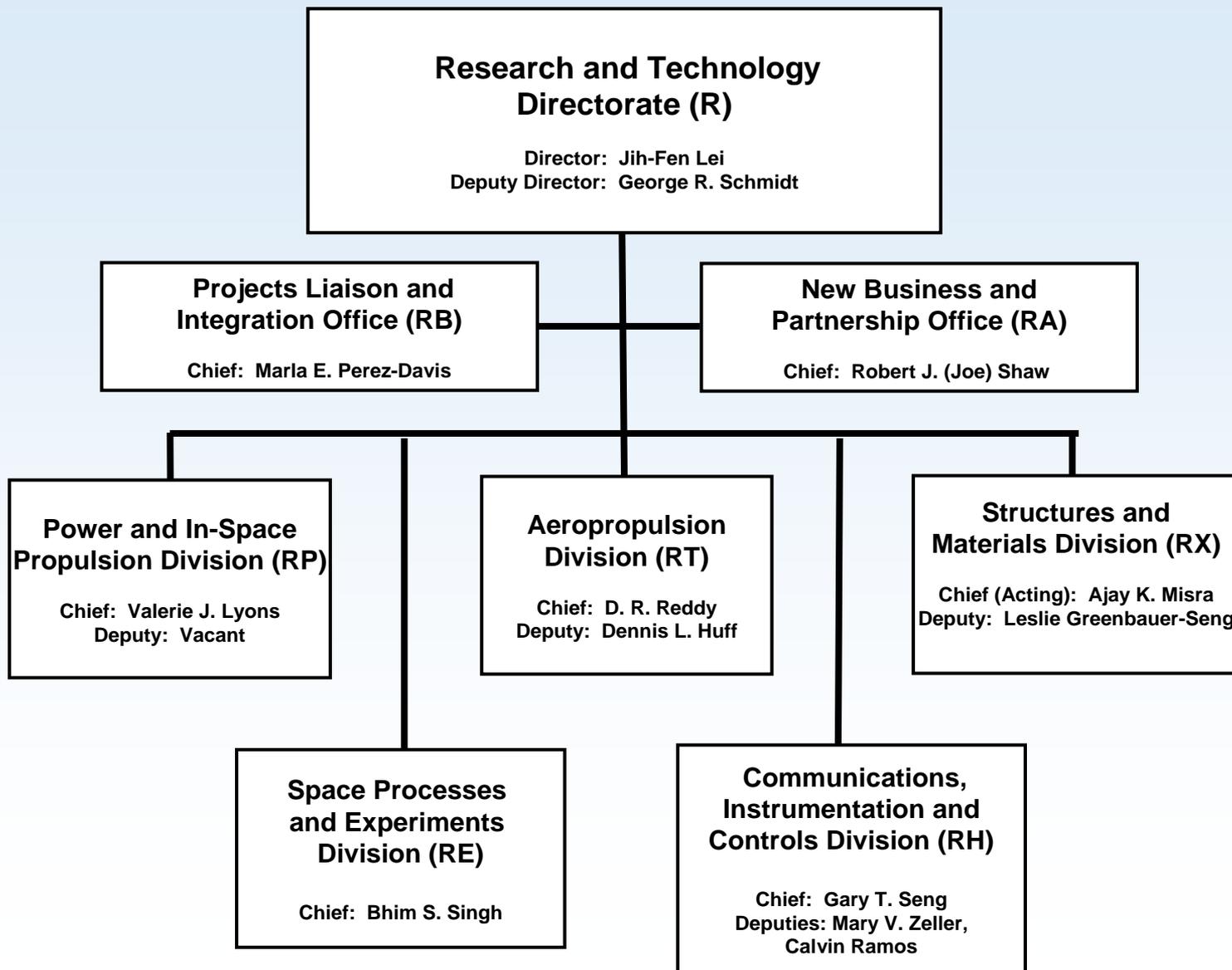


# Glenn Center Organization





# Research and Technology Directorate





# R&T Mission Distribution

R&T supports the majority of NASA Mission Projects

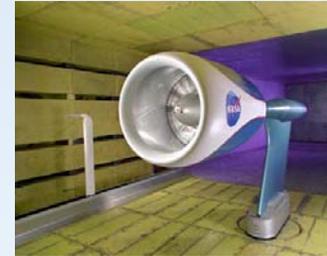
Various application/hardware sets (no single, defined “application”)



Space Operations 4%

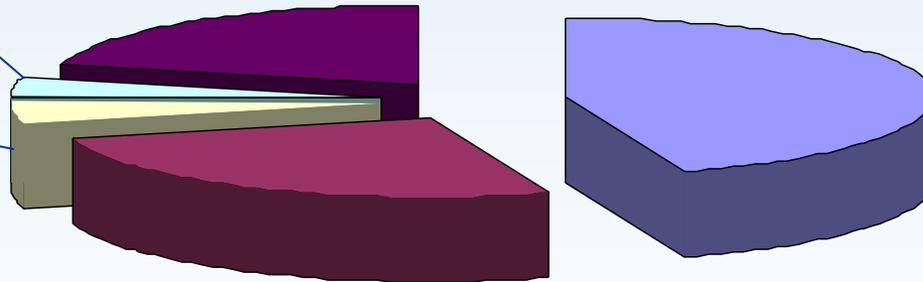


Other 21%



Aero 44%

Science 5%

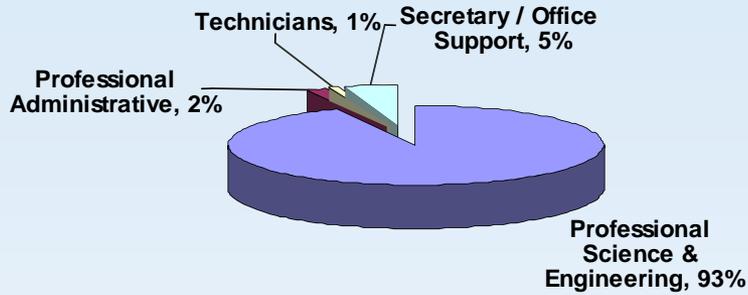


Exploration Systems 26%

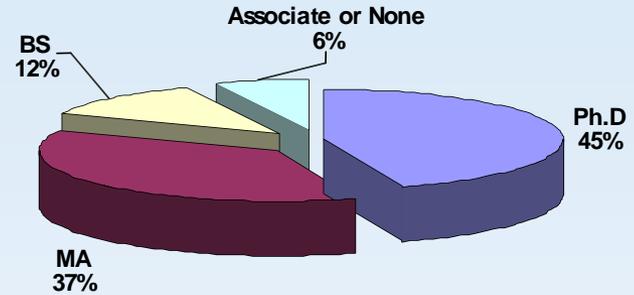




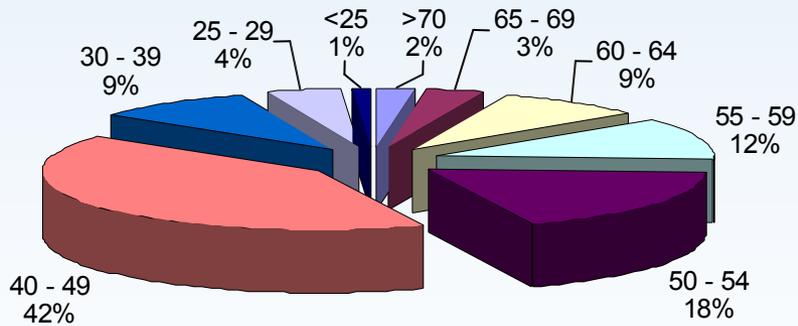
# R&T Work Force Stats



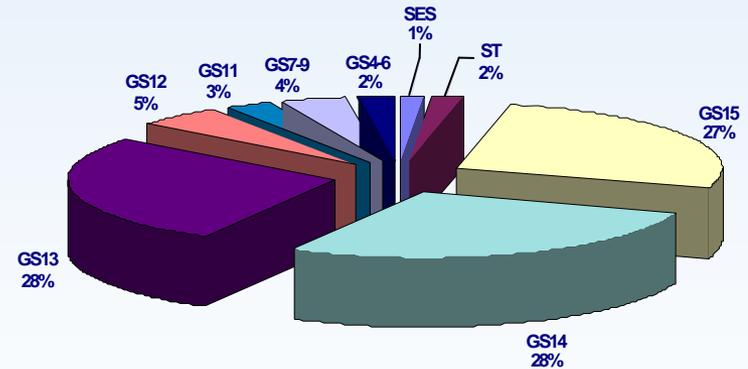
### Skills



### Education



### Age Distribution (Average Age: 49.1 yrs)



### Grade Distribution (Average Grade: 13.3)



# Over 400 R&D Labs



## SiC Chemical Vapor Deposition Growth Laboratory

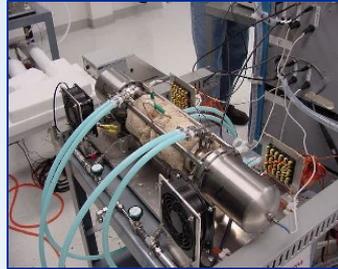


## Instrumentation & Control Division

- Sensors & Electronics
- Optical Instrumentation
- Controls & Dynamics

Number of Labs: 60

## Radioisotope Stirling Generator Test Laboratory

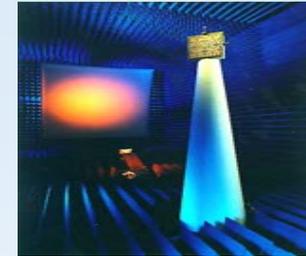


## Power & In-Space Propulsion Division

- Energy Conversion
- Energy Storage
- Power Management & Distribution
- On-board Propulsion

Number of labs: 101

## Compact Range Test Facility



## Communications Division

- Satellite Network & Architectures
- Electron Device
- Applied RF Technology
- Digital Communications

Number of Labs: 40



## Plasma Spray Facility

## Materials Area

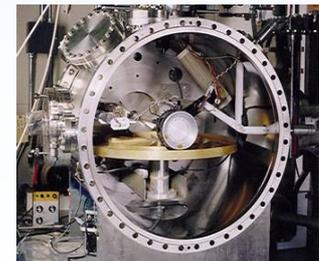
- Advanced Metallics
- Ceramics
- Polymers
- Environmental Durability

Number of Labs: 120

## Structures Area

- Acoustics
- Life Prediction
- Mechanics & Dynamics
- Mechanical Components

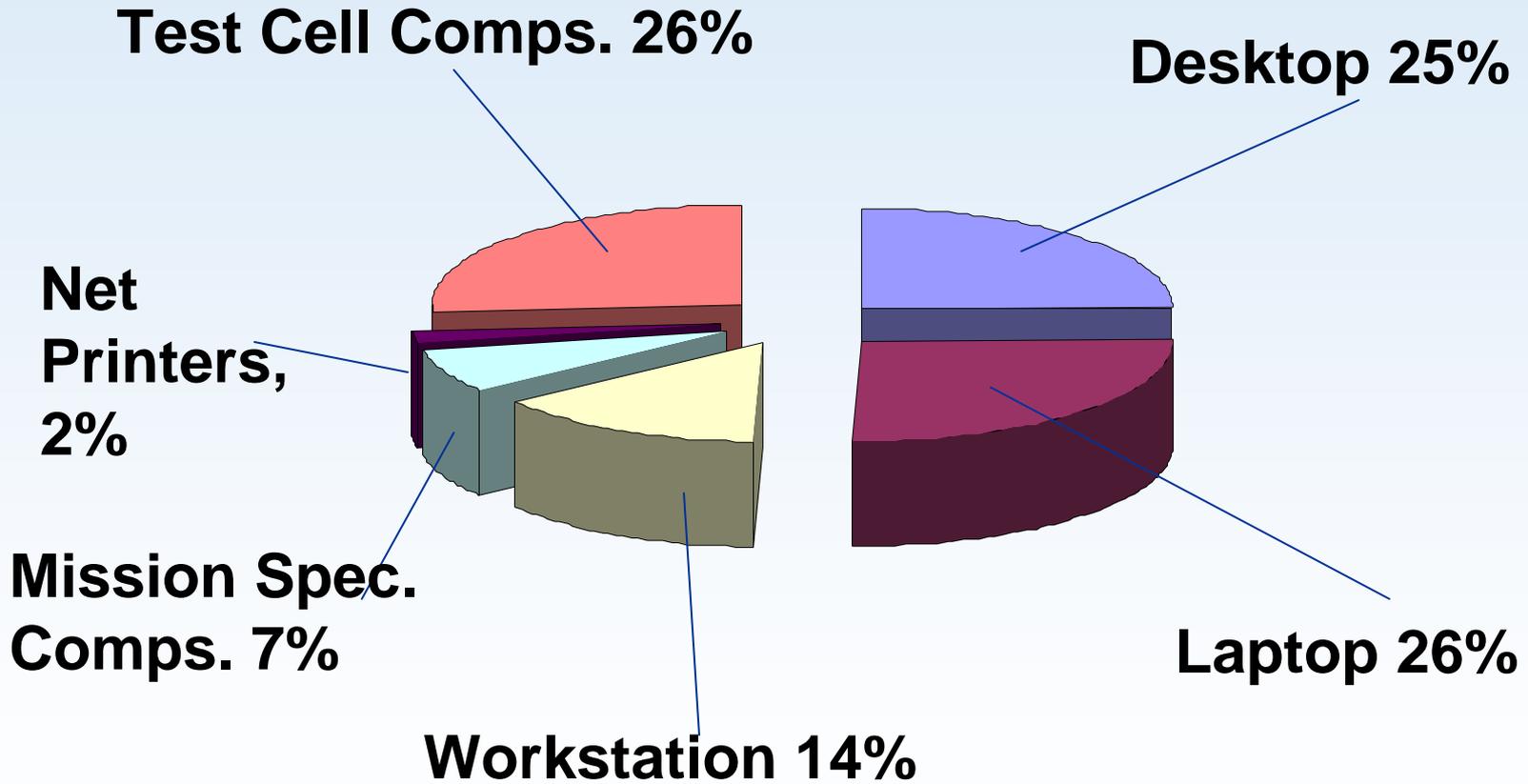
Number of Labs: 78



## Mars Pathfinder Abrasive Wheel Rig



# R&T Hardware Environment

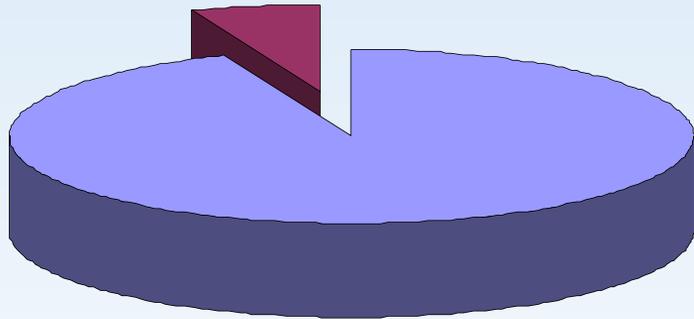


# R&T Hardware Breakdown By OS Type



## Desktop

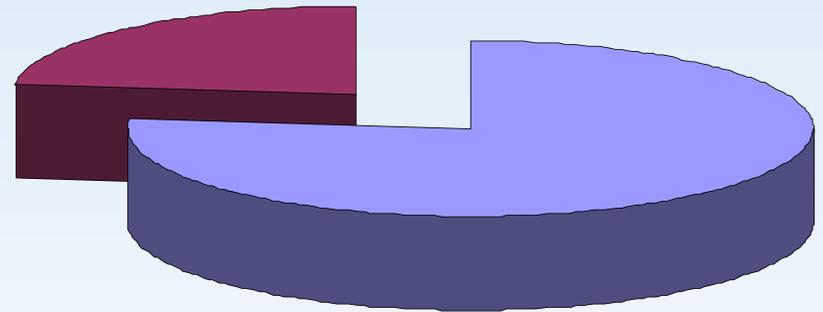
Mac 6%



Windows 94%

## Laptop

Mac 23%



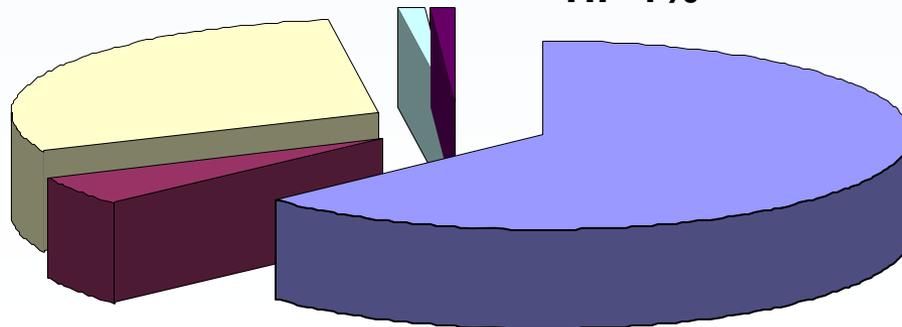
Windows 77%

## Workstation 14%

Linux 29%

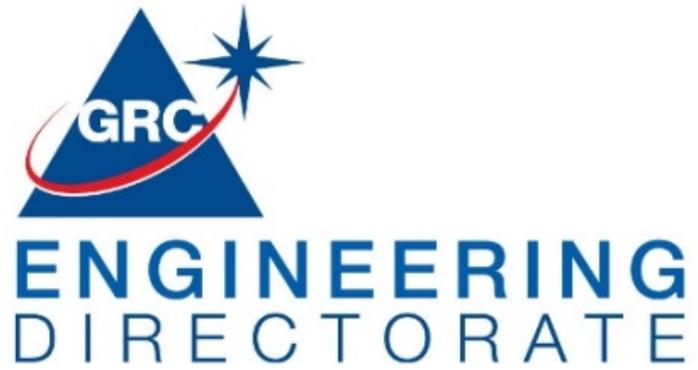
Sun 1%

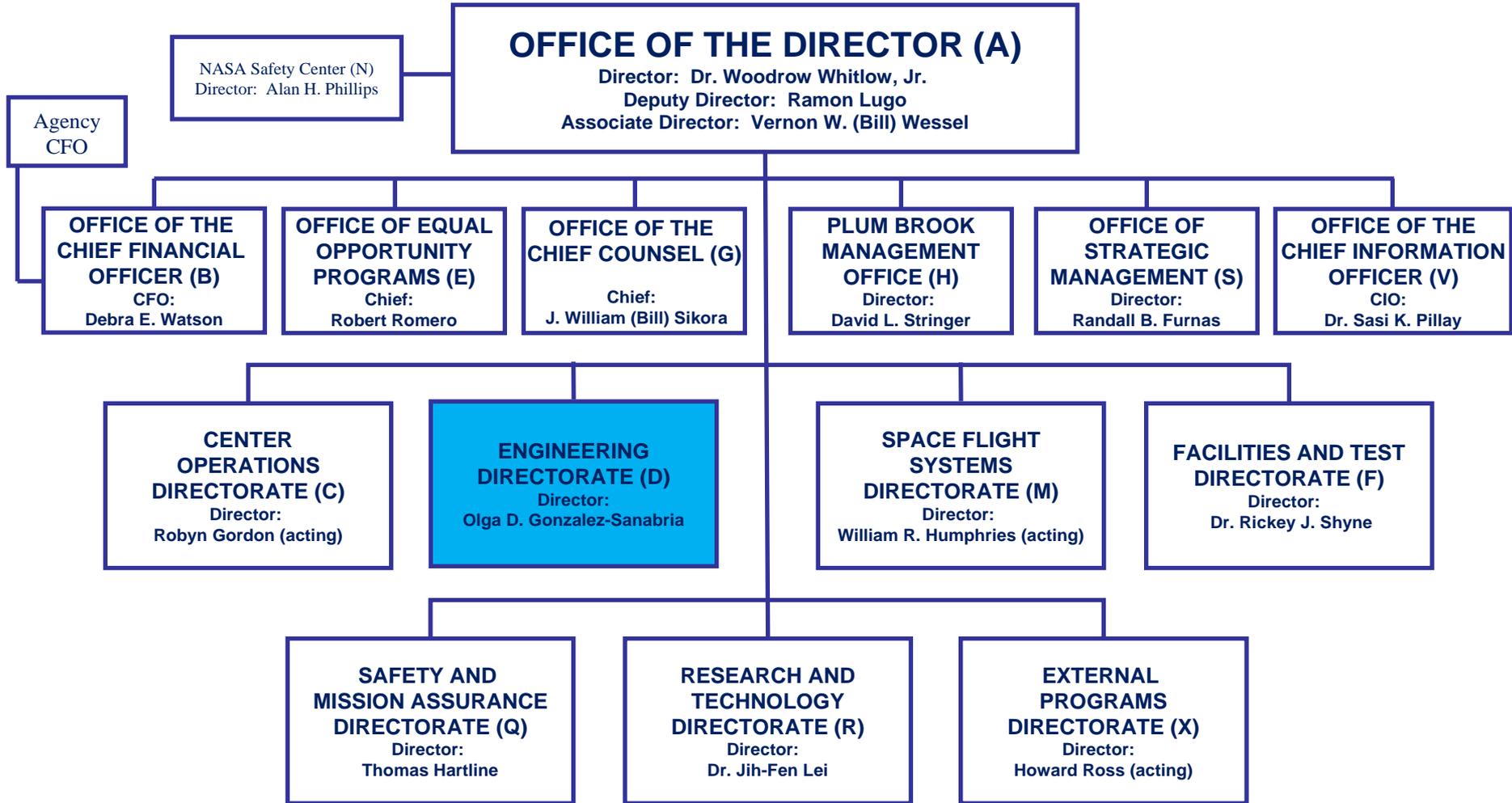
HP 1%



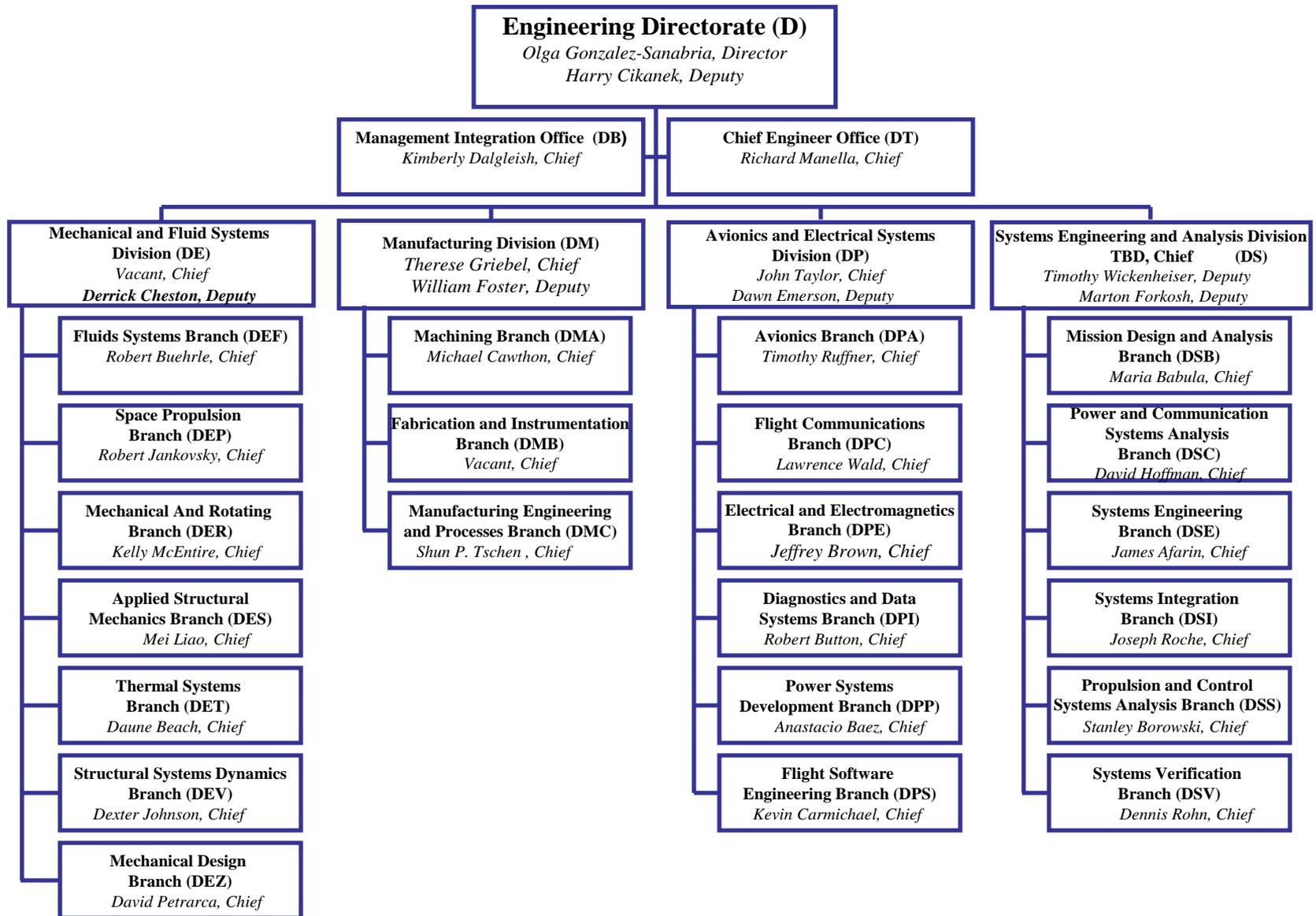
Windows 64%

Mac 5%





# Engineering Directorate Structure



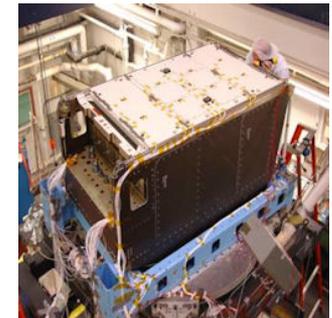
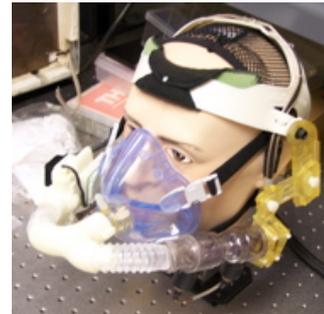
# Discipline Highlights



- **Systems Engineering and Analysis**
  - SE&I disciplines
  - COMPASS (Conceptual design)
  - Propulsion, Power, Trajectory / Mission performance, Controls
- **Mechanical and Fluid Systems Division**
  - Structures and Structural Dynamics Analysis
  - Mechanisms
  - Thermal and Fluids Analysis
  - Propulsion
- **Avionics and Electrical Systems Division**
  - Power Design and Analysis
  - Flight Software (CMMI L-II)
  - Communications, Instrumentation Systems Design and Analysis
  - Avionics, Diagnostics & Flight Data Systems
  - Electrical and Electromagnetics
- **Manufacturing**
  - Precision custom machining and instrumentation
  - Rapid response custom fab, specialty flight hardware
  - Flight and ground test hardware, STE and GSE small to large

- **Engineering Labs**

- **Compatibility Test Sets**
- **Acoustic Emissions**
- **Structural Statics**
- **Mechanical Vibration**
- **EMI / EMC**
- **Propulsion**
- **Power Management and Distribution (PMAD)**
- **Optics**
- **Exercise Countermeasures**
- **Power Systems**
- **Avionics**
- **Rocket**
- **Flight Software**

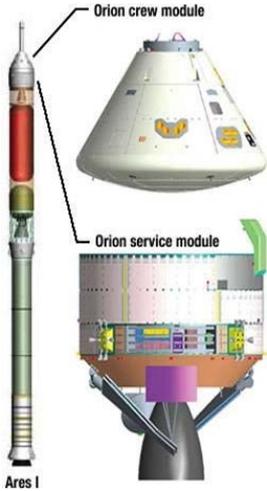


- **Collaborative and Team Space Environments**

- **Collaborative Modeling for Parametric Assessments of Space Systems (COMPASS)**
- **Integrated Design and Analysis Center (IDAC)**



# Example Programs and Projects



GRC is responsible for the management and technical oversight of the development of the Service Module which provides the primary propulsion, electrical power, fluids and life support consumables for the Orion spacecraft and Engineering leads key roles in each of these areas.



COMPASS Team design of a Centaur Orbiter which demonstrates the feasibility of radioisotope electric power for orbiting small, deep space bodies.



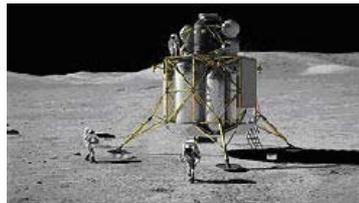
Hybrid power utility vehicle



Ares V 10 m diameter Payload Shroud



The Davi machine is capable of rolling 1.5" thick and 10' wide steel plates.



The Power System Development Branch leads the development of the electrical power system for the Agency-wide Altair lunar lander project.



Ares I-X upper stage. All 11 full-scale elements were designed and built at GRC.

The software/applications area can be best described by one of these four main categories (COTS & Non-COTS):

- **Business Applications**

- Office applications (word processing, spreadsheets, email, etc)
- Agency/Center business tools (timecard, travel, etc)
- Organizational business tools (task tracking and contract management)

- **Engineering, Design, and Manufacturing Applications**

- Design, Modeling, Machining, Analysis, and Simulation tools
- PLM/PDM, Enterprise Database tools
- Requirements gathering and Configuration Mgmt. tools

- **Lab Tools**

- Data Collection
- Analysis
- Control

- **Infrastructure/Server environment**

- Operating Systems (Windows, UNIX, LINUX, and VM)
- Back-up and Data Recovery
- Security and System Administration tools

The hardware within the Engineering environment must keep pace with the Engineering applications used. Our systems can best be categorized in one of the following four categories:

- **Administrative Systems – 5% of staff**
  - Windows and Mac Desktops and Laptops
- **Engineering Systems (32 & 64 bit) – 95% of staff**
  - Windows and Mac Engineering Laptops
  - Windows and Mac Engineering Workstations
- **Lab Systems (various and unique O/Ss, networked & non-networked)**
  - Data Collection systems
  - Control systems
  - Flight systems
- **Infrastructure Systems**
  - Shared-area and Collaborative Environment systems
  - High capacity Large format B/W & Color Printers and Print Servers
  - Application and Data Servers (EVAs)
  - Terminal servers and Virtual Machines
  - Web Servers



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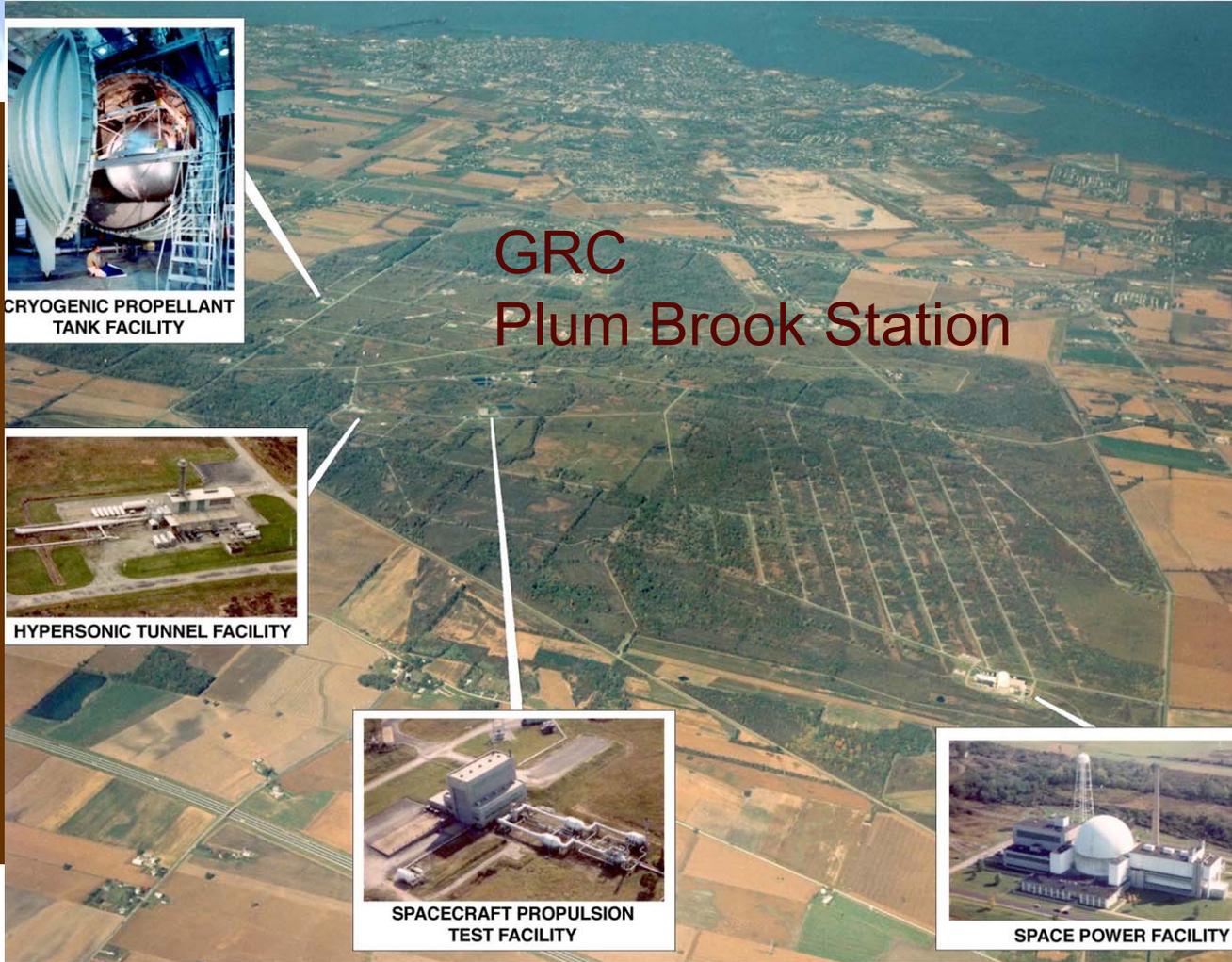
# ***GRC Plum Brook Station***

***Presenter: Boyd Vance***



# Plum Brook Station

Information Officer



**CRYOGENIC PROPELLANT TANK FACILITY**



**HYPERSONIC TUNNEL FACILITY**



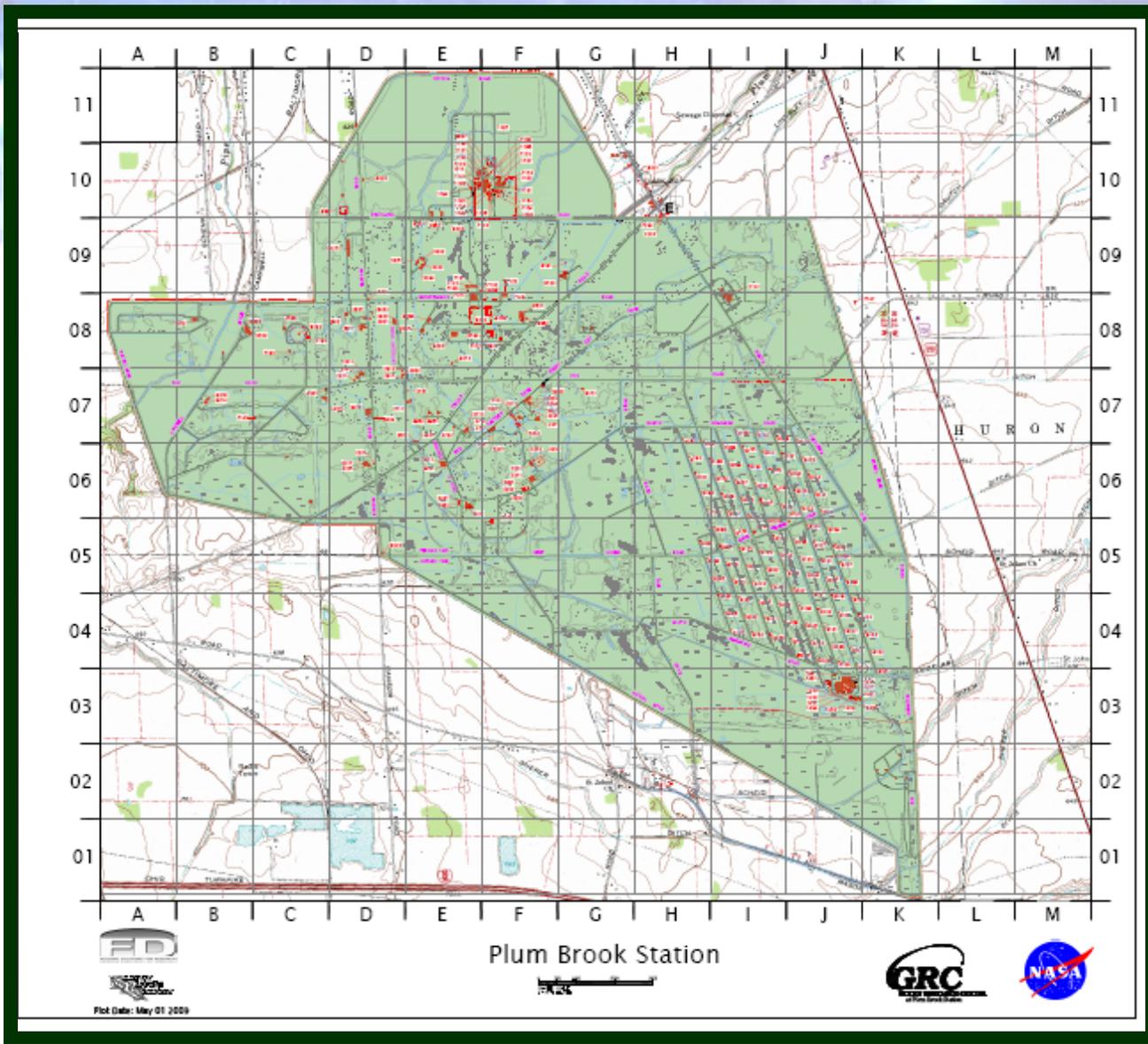
**SPACECRAFT PROPULSION TEST FACILITY**



**SPACE POWER FACILITY**



# Plum Brook Station



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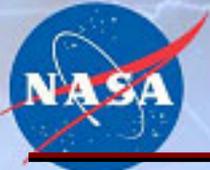


# Glenn Research Center Locations

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- Plum Brook Station is located approximately 50 miles to the west of Lewis Field



# PBS General Network

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- The Plum Brook network is connected to Lewis Field via a DS3 circuit
- The main router (*Cisco 6500 Layer 3 Switch*) for Plum Brook is located in the Engineering Building (*Bldg. 7141*).
  - All NASA network connections fan out from there along the depicted fiber paths
- There is currently a mix of multi- and single-mode fiber
- Each facility has one or more network switches to accommodate the clients at that location
- All switches are “trunked” to allow the extension of specific vlans (*IP Subnets*) to specific areas.
  - Two primary vlans are in use at Plum Brook today
- The current fiber and switch configurations support 100 mbps speeds throughout Plum Brook
- The main telephone switch for Plum Brook is located in Building 7233 and is connected to all facilities via copper

# PBS General Network Layout



Officer

