



# NASA Ames Research Center

**Christine Munroe  
Small Business Specialist  
March 6, 2012**





# Upcoming Requirements Overview of Divisions



## Intelligent Systems Division Research and Development Support (ISRDS)

NASA Ames Research Center  
Moffett Field, CA 94035



# Division Overview



The Intelligent Systems Division performs mission-driven development in software, computer science, and information technologies to enable new mission concepts, decrease mission operations costs, increase science return, and increase mission assurance.

Consists of four technology areas

- Autonomous Systems and Robotics (ASR)
- Collaborative & Assistant Systems (CAS)
- Discovery and Systems Health (DaSH)
- Robust Software Engineering (RSE)

Supports NASA mission operations

- Flight and ground operations software development
- Multi-Mission Operations Center (MMOC)

Provides software systems engineering and software project management

- ARC Small Spacecraft Office
- Johnson Space Center Mission Operations Directorate
- NOAA GOES-R project
- Lunar Atmosphere and Dust Environment Explorer (LADEE) mission
- Interface Region Imaging Spectrograph (IRIS) mission



# Division Overview



The Intelligent Systems Division (ISD) in the Exploration Technologies Directorate of the NASA Ames Research Center is a world-class software technologies R&D organization

- Approximately 105 Civil Servants and 150 support service contractors
- 45% Ph.D. and 35% Masters degree research staff.

The ISD has delivered cross-cutting technology infusions across all NASA mission directorates and many external agencies.

- Remote Agent on Deep Space One
- SuperRes tools for Mars Pathfinder
- MER Advanced Mission Ops tools
- Intelligent Flight Control
- SOFIA Automated Flight Planning
- ST-5 Antenna
- CAIB Investigation Organizer
- Solar Array Control for ISS
- Java Pathfinder verification code



The Division is well partnered with academia (Stanford, CMU, UC, etc), industry (aerospace, computer science and multiple Silicon Valley companies) and other federal agencies (DoD, FAA, DoE, etc), and additionally is CMMI L2 certified for critical flight and mission software development applications.



# Autonomous Systems and Robotics



The Intelligent Robotics Group (IRG) laboratory at ARC includes multiple rover-style platforms designed for rapid prototyping and testing of human-robot interaction systems.

- Multi-camera vision processing units for localization, recognition, and fault detection,
- Software for autonomous robot control, including deliberative planners, 3D path planners, vision-based state estimators, diagnosis engines, simulators, and human/autonomy interfaces.

Field studies are conducted on the K10 rover, built upon a Fido-style JPL base. Visualization tools suitable for field trialing include the Viz software system and associated software, developed for and deployed at JPL Mission Ops for the MER and Mars Phoenix missions.

Autonomous operation, robotic vision, navigation, mobility, and human-robot interactions technologies are tested with the K10 rover at the adjacent Marscape Test Facility, an outdoor 3/4-acre high-fidelity planetary science facility for testing remote and autonomous science exploration.



K-10 Rover



Marscape Test Facility



# Multi-Mission Operations Center



The purpose of the MMOC is to support Ames spaceflight missions with shared facilities, equipment and services.

Shared elements provide benefits through reduced costs (funding, labor and time) the sharing of common resources, and the leveraging of tools and specialized software and skills contributed by the mission community.



The MMOC provides

- Facilities to run mission operations, develop software and systems, hold meetings and reviews, conduct simulations and training exercises
- Network connections to spacecraft, NASA centers, industry sites
- Software and data management services for configuration management, repositories for active data, back-ups and archives
- Policies and procedures for handling Secure (ITAR, SBU) and Open data





# Discovery and Systems Health



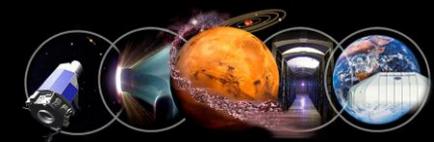
The Prognostics Center of Excellence (PCoE) provides an umbrella for prognostic technology development, specifically addressing prognostic technology gaps within the application areas of aeronautics and space exploration.

The PCoE supports the prognostics aspects of the Advanced Diagnostics and Prognostics Testbed (ADAPT) unique facility designed to test, measure, evaluate, and help mature diagnostic and prognostic health management technologies.

Hardware and a support environment are available that allow the injection of faults in a repeatable and standardized fashion such that prognostic assessments can be performed.



Electrical Power System Testbed in ADAPT Lab



## Construction

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## Missions

- Administers the Center facilities and real property management programs through its two branches, Facilities Engineering Branch (Code *JCE*) and Plant Engineering Branch (Code *JCM*).
- Provides engineering expertise (e.g. mechanical, electrical, civil, structural systems, and controls) to all Facilities activities and projects.
- Provides maintenance operations to all Center infrastructures and all NASA occupied buildings.
- Provides maintenance and engineering services to non-NASA tenants through cost-reimbursable agreements.

## Products and Services

- ARC Master Plan and services (JCE)
- Historical & Cultural Preservation Plan and services (JCE)
- Real Property Inventory, Facilities Utilization Database, GIS mapping (JCE)
- Real Property condition assessment reports (JCM)
- Project justification and planning documents (JCE)
- Project schedule and cost estimates (JCE & JCM)
- Construction of Facilities Program (JCE)
- Project management services (JCE & JCM)
- Facilities engineering and design services (JCE)
- Engineering Document Control (JCE)
- Construction engineering and management services (JCE)

## **Products and Services**

- Real Property Maintenance Program and services (JCM)
- Utility plant operations and services (JCM)
- Energy Management Program and services (JCE)
- Real Property demolition and disposal services (JCE & JCM)
- Building Systems Maintenance and repair (JCM)
- Utility Systems Maintenance and repair (JCM)
- High Voltage Electrical repair and switching (JCM)
- Roads and Paving Maintenance and repair (JCM)
- Environmental Remediation and Program implementation (JCM)
- Grounds Maintenance (JCM)
- Other Facility Needs - Customer Funded Services Requests (JCE & JCM)