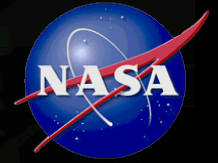


A composite image of the solar system. On the left, a portion of Earth is visible, showing continents and clouds. In the center, the Sun is a large, glowing orange sphere. The Moon is shown in orbit around Earth. To the right of the Sun are the planets Mars, Jupiter, and Saturn. A bright comet with a long tail is streaking across the upper right portion of the image. The background is a deep blue and purple space filled with stars and a distant galaxy.

NASA John F. Kennedy Space Center  
Research and Technology Capability Areas

Karen Thompson, Center Chief Technologist  
January 12, 2011

# Remediation and Ecosystem Sciences

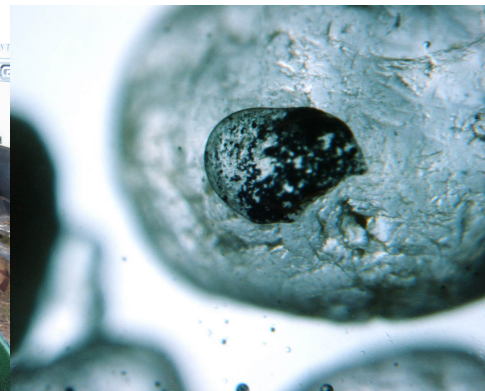


## ➤ Examples of KSC Work:

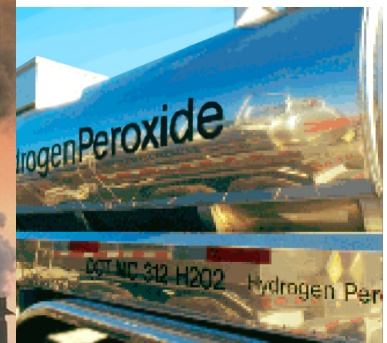
- Pollution or Contaminants Removal from Soil, Groundwater, Sediment
- Carbon Sequestration
- Preservation of Natural Ecosystems
- Alternate Energy Prototypes, Energy Grid, Solar Power
- Hazardous Environment Mitigation Technologies



Converting Agricultural Land into Clean Energy Production/R&D Use

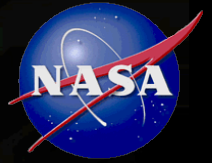


Emulsified Zero Valent Iron  
NASA's Commercial Invention of the Year - 2005



Emission Control Technology  
For elimination of hazardous waste stream of hypergols has application for coal-fired power plants

# In-Situ Resource Utilization and Surface Systems



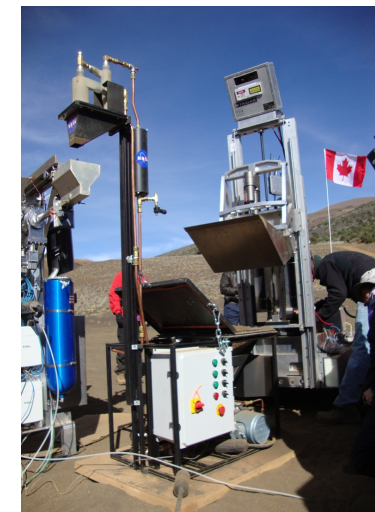
## ➤ Examples of KSC Work:

- Water Ice Prospecting and Mining
- Volatiles Prospecting and Capture
- Oxygen, Water and Propellants Production
- Propellant Scavenging from Landers
- Trash/Waste Re-cycling for Water and Methane
- Dust Filtering System for Gas Flow Capture
- Regolith Handling Techniques and Site Preparation
- Surface Stabilization for Dust Mitigation
- Anchoring Systems for Low Gravity Environments
- Interfaces and Umbilical Systems for Commodity Transfer
- Implements and Attachments for Surface Vehicles
- Modular Surface Support Equipment
- Access and Handling Techniques and Equipment

Regolith and Environment Science and Oxygen and Lunar Volatile Extraction (RESOLVE) Experiment

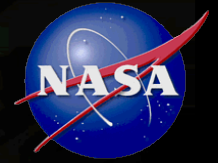


Lunar Attachment Node for Construction & Excavation (LANCE) Blade



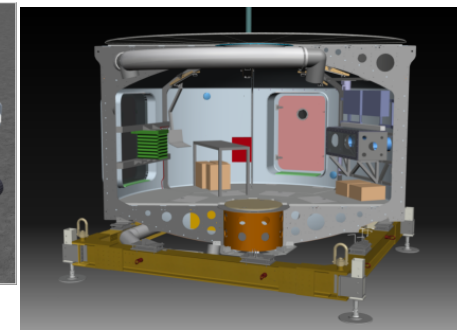
Carbothermal ISRU Plant  
Pneumatic Regolith Feed System

# Life Cycle Optimization of Products, Projects, and Programs

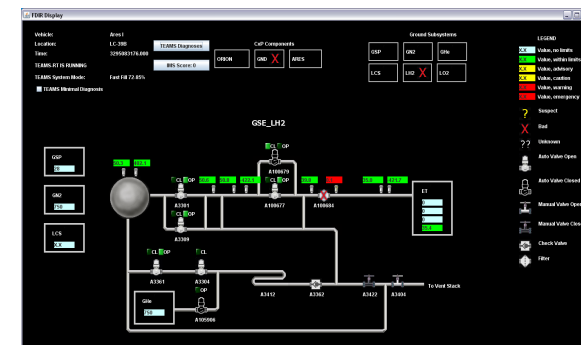
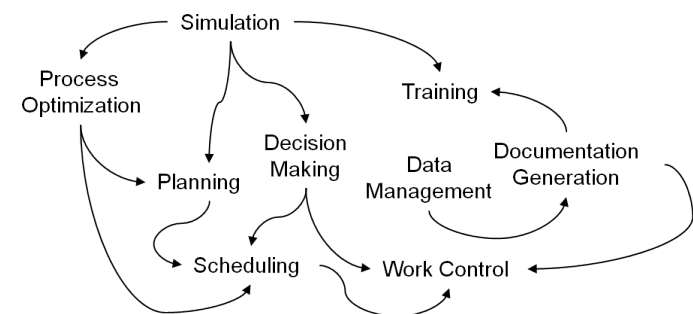


## ➤ Examples of KSC Work:

- Multi-Dimensional Visualization Technologies
- Multi-Dimensional Supply Chain Management Tools and Technologies
- Multi-Decadal Projects, Multi-Systems and Multi-Phase Distributed Simulation Technologies
- Human Centered Design Technologies
- Multi-Disciplinary Collaborative Technologies (Human Machine Cognition, Situational Awareness Technologies, Advanced Interaction Devices and Systems)
- Information Representation Technologies, including Symantec Representations and Computer Reasoning Technologies, including Intelligent Agents
- Multi-System, Multi-Discipline Simulation Based Analysis, Integration, Test and Verification Technologies
- Intelligent Systems Health Management (ISHM): Fault Detection Isolation and Recovery



Modeling and Simulation of Habitation Demonstration Unit

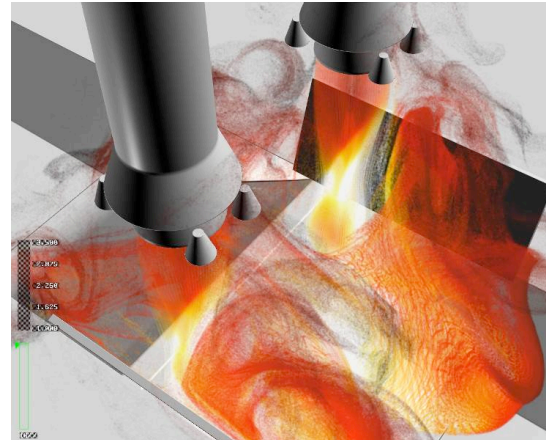


Fault Detection Isolation & Recovery (FDIR)—Diagnosis of Clogged Liquid Hydrogen Filter

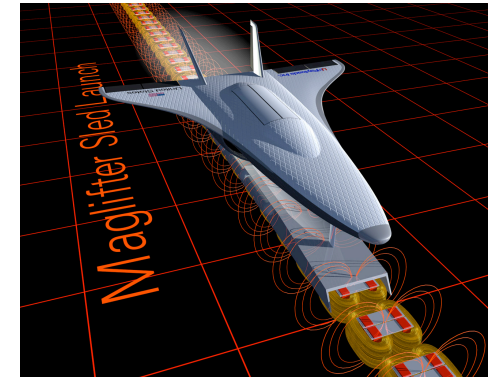
# Space Launch and Suborbital Technologies



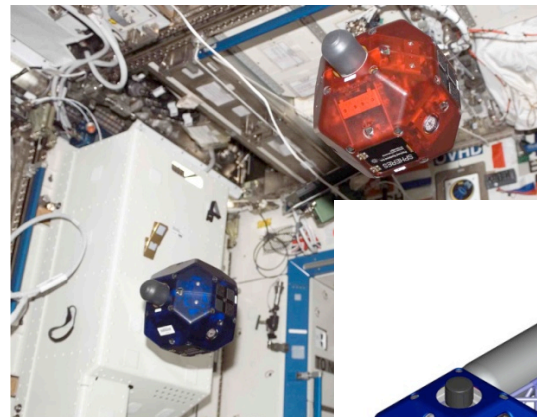
- Examples of KSC Work:
  - Horizontal Launch Technologies
  - Alignment Measurement Systems
  - Characterization of Vibro Acoustic Environment
  - External Suborbital and Hypersonic Research Pod for Suborbital Heavy-Lift Vehicle
  - Reduced Gravity Propellant Thermodynamics Analysis Techniques for Predicting Thermodynamic State of Cryogenic Propellants on Orbit
  - Research of Reduced Gravity Propellant Slosh Testing for Anchoring of Computational Fluid Dynamics (CFD) Modeling of Slosh Behavior



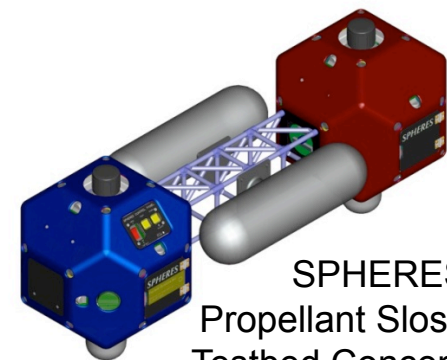
CFD Analysis of Ignition Overpressure within Solid Rocket Booster (SRB) Flame Trench Environment



eLaunch Hypersonic Launch Vehicle Concept

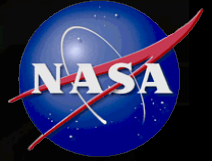


Synchronized Position Hold Engage and Reorient Experimental Satellites (SPHERES) facility onboard ISS



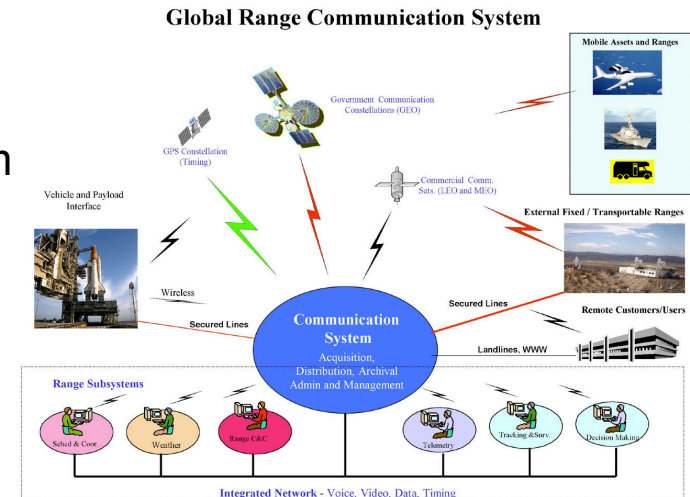
SPHERES Propellant Slosh Testbed Concept

# Tracking, Timing, Communications, Navigation and Weather Technologies

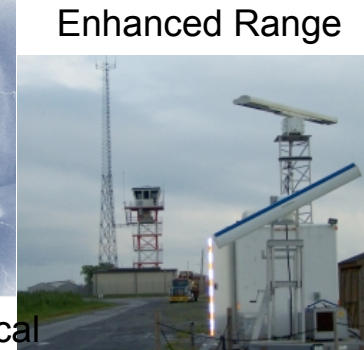


## ➤ Examples of KSC Work:

- Tracking and Surveillance for Aero/Space Platforms
- Telemetry and Communication for Aero/Space Platform
- Range Command and Control, Communication and Monitoring
- Aeronautical, Space, and Surface Systems TT&C and Networking Subsystems
- Wireless RF links, relays, and Free Space Optical Communications
- Secure and Non-secure Standards and Protocols
- Range Safety Systems
- Advanced Networking Technologies
- Advanced Fixed and Tracking Antenna Technologies
- Innovative Technologies for Spectrum Management
- Weather Measurement and Forecasting
- Advanced Decision Making Algorithms
- Advanced Network Security Protocols and Methods
- Advanced Flight Data Management and Delivery Technologies



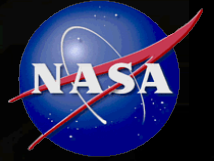
High-Fidelity Numerical Weather Prediction



Enhanced Range



Free Space Optical Research and Field Measurement



**Development Office is the  
front door for business and  
partnerships**

**<http://kscpartnerships.ksc.nasa.gov>**

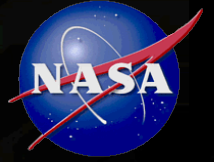
**Joyce Riquelme**

**Center Planning & Development Office**

**Joyce.M.Riquelme@nasa.gov**



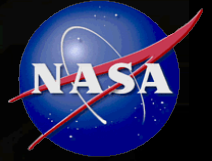
# Research and Technology Capability Areas at the John F. Kennedy Space Center



- Storage, Distribution and Conservation of Fluids (Cryogenics, Liquids, Gases)
- Materials for Life Cycle Optimization
- Life Sciences & Habitation Systems
- Remediation and Ecosystem Sciences
- In-Situ Resource Utilization and Surface Systems
- Life Cycle Optimization of Products, Projects, and Programs
- Space Launch and Suborbital Technologies
- Tracking, Timing, Communications (TT&C) and Navigation Technologies



# Storage, Distribution and Conservation of Fluids (Cryogenics, Liquids, Gases)

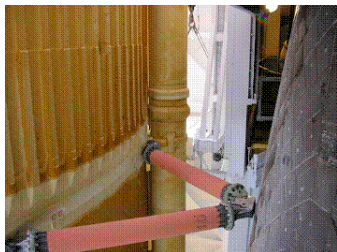


## ➤ Examples of KSC Work:

- High Efficiency Storage, Distribution and Recovery Systems; including Transfer Losses and Re-liquefaction of Boil-off
- Aerogel Insulation Systems for Helium Purge Elimination
- Thermal-Fluid Analysis of Composite Overwrapped Pressure Vessels (COPV) Loading
- Energy Efficient Thermal Insulation Systems
- Helium Life Cycle Cost Reduction and Limited Resource Conservation
- Breathing Air for Propellant Handler's Ensemble, Environmental Control & Life Support System (ECLSS), and Habitation
- Development of Innovative Components and Instrumentation
- Detection and Isolation of Hazardous Gases and Fluids

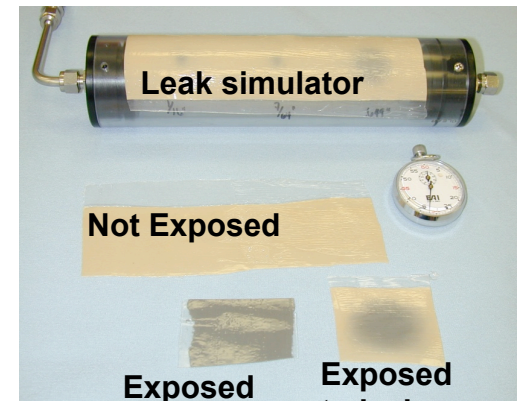


Integrated Refrigeration and Storage System



Aerogel Insulation used for External Tank LO2 Bellows Ice Elimination

Pulse Tube Cryocooler for Oxygen Liquefaction



Chemchromatic sensing for detection of hypergols and H2

# Materials for Life Cycle Optimization

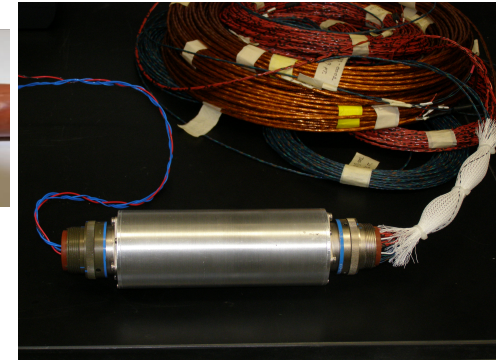


## ➤ Examples of KSC Work:

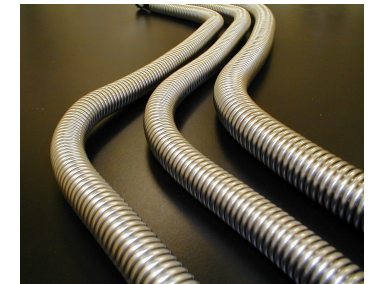
- Corrosion Detection and Mitigation
- Non-Destructive Evaluation/Inspection
- Wire Fault Detection and Self Repair Systems
- Multilayer Insulation Systems for Superconducting Power Cables
- Environmentally Friendly, Long Life Materials (Anti Microbial, Low Flammability)
- Electrostatic Charge Dissipation Technologies
- Repair of Composites and Advanced Materials



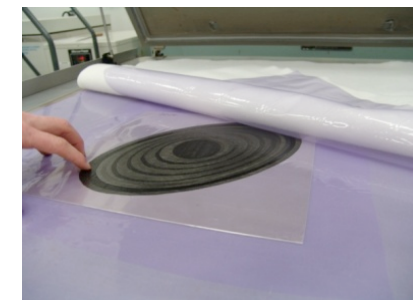
Wire Fault  
Repair and  
Detection  
System



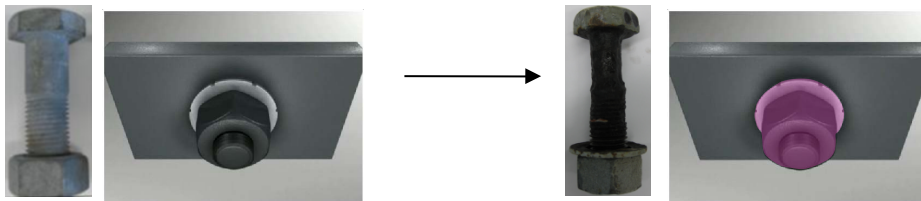
Insulation Systems  
for High Efficiency  
Long-Length  
Flexible Piping



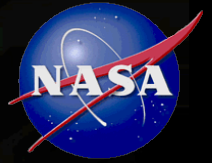
Corrosion Detection and Control



Composite Repair for Large  
Structures



# Life Sciences and Habitation Systems



## Examples of KSC Work:

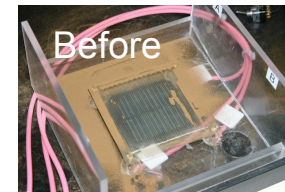
- Microbial, Plant, Cellular and Animal Investigations
- Bio-regenerative and Biological Closed Loop Life Support Systems
- Advanced Protective Equipment Testing and Development, Heat Stress Mitigation
- Commercial Space Flight – Evidence-based Crew and Passenger Medical Screening Tools and Crew and Passenger Medical Standards, Hazards Assessments, In-flight Medical Emergency Treatment Protocols, Passenger Spaceflight Training Programs
- Self Healing for Inflatable Structures
- Space Bio-imaging
- Dust Mitigation on Windows/Solar Panels/Thermal Radiators/Batteries and Power Systems
- Dust Tolerant Seals, Mechanisms, and Connections
- Light Emitting Diode (LED) Technologies to Enhance Human Adaptation



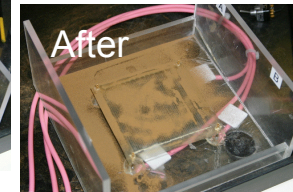
Vegetable Production Unit



Biological Water Processors



Before



After

Dust Mitigation Technology on Solar Panel

Dust Tolerant Connector



ResQPod increases blood circulation to brain

