

# National Aeronautics and Space Administration

LYNDON B. JOHNSON SPACE CENTER  
WHITE SANDS TEST FACILITY



## UNIQUE PROPULSION TEST EXPERTISE

### HYPERGOLIC PROPELLANTS

#### Hypergolic Propellant Handling

White Sands Test Facility (WSTF) can dispatch propellant handling teams anywhere in the United States to support projects. Recent support includes Wallops Island, Virginia; Kauai Test Facility, Hawaii; and Houston, Texas. Hypergolic propellants such as nitrogen tetroxide, inhibited red fuming nitric acid, hydrazine, monomethylhydrazine, and unsymmetrical dimethylhydrazine have been used and stored at WSTF since 1964.

#### Propellant Saturation

- Conducted studies and developed procedures for saturating hypergolic propellants with inert gases to more closely simulate in-flight conditions
- Developed procedures for determination of propellant saturation levels used industry wide

#### Iron Nitrate Problems

- Conducted studies of impact to various components and systems; techniques such as molecular sieves developed to reduce contamination of nitrogen tetroxide systems with solid iron nitrate.
- Built molecular sieve units to remove iron nitrates from nitrogen tetroxide for use at WSTF, Kennedy Space Center (KSC), and other government facilities

#### Electrical Devices in Hazardous, Flammable, and Explosive Environments

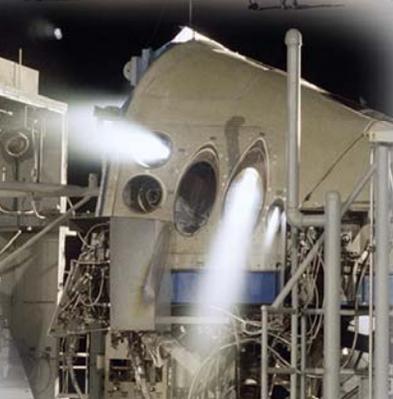
- Expertise in applying National Electric Codes and National Fire Protection Association codes to hazardous propellant installations

#### Hypergolic Handling Training

- Developed and gave a detailed course at NASA Johnson Space Center, NASA Lewis Research Center, KSC, Naval Weapons Center, China Lake, Sandia National Laboratories, General Electric, and many other locations on hypergolic propellants that covered storage, handling, transport, safety equipment, and emergency response
- Classes are tailored to the individual audience and can vary from intense classroom discussions of new chemical analytical techniques to in-the-field training with Level A totally encapsulating protective suits
- WSTF can provide hands-on training to customer personnel in handling hypergolics during over-the-road transport.

#### Personal Protective Equipment (PPE)

- Provides expertise in development and qualification; works with vendors to provide adequate detection equipment and PPE for use in hypergolic propellant handling
- Training covering hydrogen and oxygen system design and operations are also available.



# National Aeronautics and Space Administration

LYNDON B. JOHNSON SPACE CENTER  
WHITE SANDS TEST FACILITY



## Environmental

- Knowledgeable in all regulatory and safety aspects for proper handling of hazardous wastes from hypergolic propellant activities
- WSTF personnel has researched advanced methods of treating such hazardous wastes including the development, construction, and validation of a unique disposal system for hydrazine-type wastes at Vandenberg Air Force Base
- Experienced in all aspects of the preparation of environmental assessments and impact statements for new projects involving hypergolic propellants

## **OTHER PROPELLANTS AND DEVICES**

### Hydrogen Handling

- Hydrogen ignition studies conducted to determine ignition energies for hydrogen air mixtures
- Liquid oxygen/liquid hydrogen mixing simulation studies performed using liquid nitrogen and liquid hydrogen that determined stratification and static ignition potential.
- Cryogenic Handling
- Liquid nitrogen, liquid oxygen, and liquid hydrogen routinely handled
- Explosive Device Handling
- Squibs, NASA Standard Initiators, and plastic explosives routinely handled

## **TEST OPERATIONS**

### Bubble Point Testing

- Developed and constructed units to test the propellant acquisition screens in the Shuttle Orbital Maneuvering Subsystems and Reaction Control Subsystems for use at KSC and provided training to KSC personnel

### Hydrostatic Burst Testing

- Tested high-pressure tubes from tube banks; proved significant energy released when tubes burst while undergoing hydrostatic testing, which could easily endanger lives; created significant impact on industry hydrostatic test procedures

### System Leak Detection

- Developed and applied helium mass spectrometer and ultrasonic detection techniques to large propellant systems

## **CONTACT**

David Baker, NASA White Sands Test Facility, Chief, Propulsion Test Office  
[david.l.baker@nasa.gov](mailto:david.l.baker@nasa.gov), 575.524.5605

