



Safety Message

Ames Arc Jet DC Power Supply Fire



Leadership VITS
September 18, 2006

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The Facility

The NASA Arc Jet Complex located at Ames Research Center supports Space Flight missions by developing, evaluating and qualifying advanced thermal protection materials/systems

A 150 megawatt DC power supply and associated arc heater generates a high temperature, supersonic flow to simulate reentry conditions



Arc Jet Complex



The Mishap

February 3, 2006

During Arc Jet operations a DC Power Supply Module was discovered burning

Internal components were severely damaged

Classified Type C mishap
(\$25,000 to \$250,000 property damage)

There were no injuries to personnel





Sequence of Events

Mid January 2006: An Integrated Systems Test was conducted for new DC Power 'B' Modules

- The 'B' Modules were connected to the 4070 volt main buses that also feed the older 'A' Modules
- The 'B' Modules are normally electrically isolated during operations using 'A' Modules

January 26, 2006: Temporarily resumed normal operations using older DC Power 'A' Modules

- High-voltage AC buses were left connected to the new 2B and 5B Modules

February 3, 2006: Module 2B cooling water turned off after a leak was detected

February 3, 2006, ~11:30 AM: Smoke was reported rising from the DC power modules

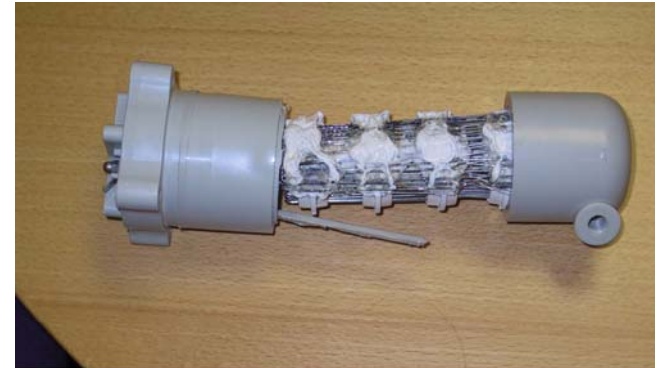




Proximate Cause

The fire in Module 2B was caused by overheated resistors

- Resistor overheated and started the fire because cooling water was not circulating within the resistor case





Root Causes

Contributing Root Causes

- 'B' Module high-voltage connected while running with 'A' Module power supply
- The 2B Module cooling water was shut off

Primary Root Cause

Breakdown in communication

- Test engineer assumed 'B' Modules were not connected to high-voltage AC bus
 - **Not concerned about water pump**
- Electricians unaware that simultaneous 'A' and 'B' high-voltage connections generate excessive resistor heating
 - **Not concerned about high-voltage bus connections**





Lessons for NASA

Extreme vigilance is required during configuration changes to ensure safety controls remain effective

- Develop, document and follow procedures, drawings or checklists when making critical/significant changes

Ensure the system's true state is understood by everyone involved

- Avoid processes/designs that permit inconsistent or incorrect perceptions about current conditions

Effective communications during high-risk operations are imperative!

