



National Aeronautics and
Space Administration
John H. Glenn Research Center

Fire Detection Organizing Questions

Workshop on

Strategic Research to Enable NASA's Exploration Missions

*June 22 - 23, 2004
Marriott Downtown at Key Center
Cleveland, Ohio USA*



National Aeronautics and
Space Administration
John H. Glenn Research Center

Strategic Research to Enable NASA's Exploration Missions

June 22 - 23, 2004

Cleveland, OH

Fire Detection Sub-Element Products

1. Verified models of fire precursor transport in low and partial gravity
 - a. Development of models for large-scale transport in reduced gravity
 - b. Validated CFD simulations of transport of fire precursors
 - c. Evaluation of the effect of scale on transport and reduced-gravity fires
2. Advanced fire detection system for gaseous and particulate pre-fire and fire signatures
 - a. Quantification of pre-fire pyrolysis products in microgravity
 - b. Suite of gas and particulate sensors
 - c. Reduced gravity evaluation of candidate detector technologies
 - d. Reduced gravity verification of advanced fire detection system
 - e. Validated database of fire and pre-fire signatures in low and partial gravity



National Aeronautics and
Space Administration
John H. Glenn Research Center

Strategic Research to Enable NASA's Exploration Missions

June 22 - 23, 2004

Cleveland, OH

FPDS Organizing Questions

Fire Signatures and Detection

1. What is the background particulate and chemical species loading in a spacecraft and how does it vary with time?
Impact of absence of gravitational settling, long term off-gassing, ECLSS performance.
2. What are the appropriate pre-fire and fire signatures for fire detection in low and partial gravity?
Smoke particulate, gaseous species, light emission
3. Is there a normal gravity analog to quantify low and partial gravity fire signatures?



National Aeronautics and
Space Administration
John H. Glenn Research Center

Strategic Research to Enable NASA's Exploration Missions

June 22 - 23, 2004

Cleveland, OH

FPDS Organizing Questions

Fire Signatures and Detection -continued

4. What type or suite of sensors minimize the time to alarm and yet eliminate nuisance alarms?

Tradeoff between mass, reliability and false alarms

5. Where should fire detectors be placed to minimize the time for a detection system to alarm?

No buoyant convection, tortuous flow paths

6. How much warning time will the crew get with a particular fire detection system?

Consider convection time in module, fire growth rate