Fires: Microgravity vs. Earth

- Non-convecting purely diffusive environment
- No bouyant flow-- heated gases don’t rise
  - Example: Candle Experiment
    - $O_2$ supply dependent on STS/ISS ventilation fans
    - CO orders of magnitude higher-- more toxic
    - Flammable material still present after fire is extinguished
    - Hemispherical flames
STS/ISS Detection Designs

- **CURRENT (STS)**
  - Ionization detection, Freon-1301 bottles, and handheld Halon-1301 extinguishers
  - NASA requirements: Each payload must monitor SOH--multiple sensors

- **FUTURE (STS/ISS)**
  - SECOND GENERATION HALON REPLACEMENTS: Flame-Ex & Halon 1211
  - FIRESCAPE: Images invisible flames of alcohol & hydrogen fires--sees through smoke
  - SOLID-SOLID HYBRID GAS GENERATOR
Concluding Remarks

- Need more data on microgravity combustion
- Ground-based scientists will have to adopt new approaches to space combustion phenomena
- Each component will continuously need to be monitored for overheat conditions
- Combination of new technologies utilized
  - Portable extinguishers will continue to be used in manned area so 2nd generation Halon replacements are a given
  - Solid-solid hybrid gas generators likely since the pros far outweighed the cons
  - FIRESCAPE will possibly be an asset on the launch pad but not relevant to STS or ISS
References

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