Orbital Technologies Corporation (ORBITEC)

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Current and Potentially Available Flight Systems

- Biomass Productions System (BPS)
- Plant Research Unit (PRU)
- AstroGarden
- VEGGIE
- Advanced Animal Habitat (AAH)
- Solid State Lighting

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Biomass Production System (BPS)

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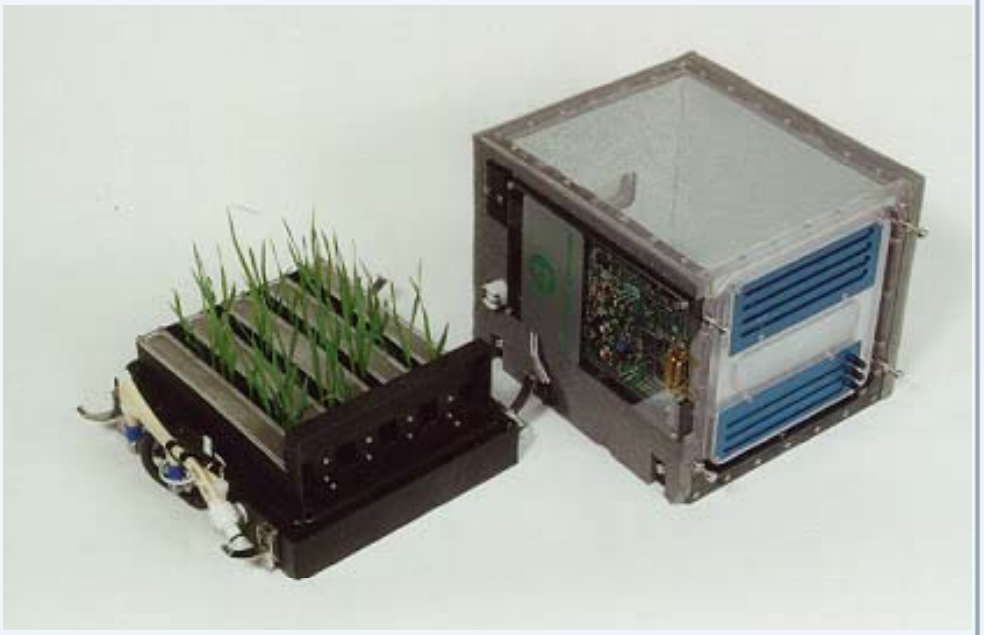
BPS Specification

MAIN SPECIFICATIONS

- Size: double mid-deck locker
- Chamber shoot area: 964 cm^2
- Shoot height: 18.8 cm
- Temperature: 18 – 35°C ± .2°C
- Humidity: 65 – 90 % RH ± 10%
- Light: 0 – 350 µmol/m2/s
  - (cool white flourescent)
  - (with red/blue LED lights)
- CO2: 0 – 3,000 ppm
- Ethylene removal
- Video still imaging of chamber
- In-Flight Access: Allowed
- Express rack Ethernet communication interface
- Regenerable H2O recovery loop, H2O supply
- Replenishable CO2 supply



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BPS on ISS

Brassica, 36 Days after Planting

BPS Being Transferred from the Space Shuttle to the International Space Station (April 2002)

ISS004E10027

Wheat, 20 Days after Planting

Harvesting Brassica on ISS

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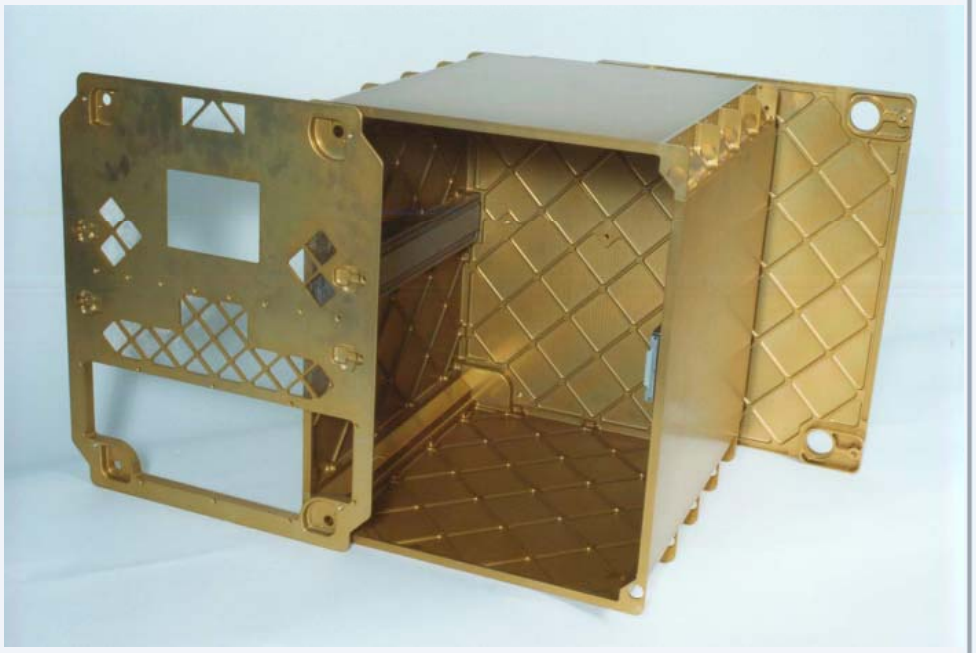
BPS Enclosure

- Mid deck compatible
- Express rack compatible
- Has flight Heritage (previously flown on STS and ISS)
- ORBITEC can provide structural verification for new payloads to be integrated into enclosure
- Adaptor plates provide flexibility in mounting
- Integrated rail system allows payload to extended from Express Rack



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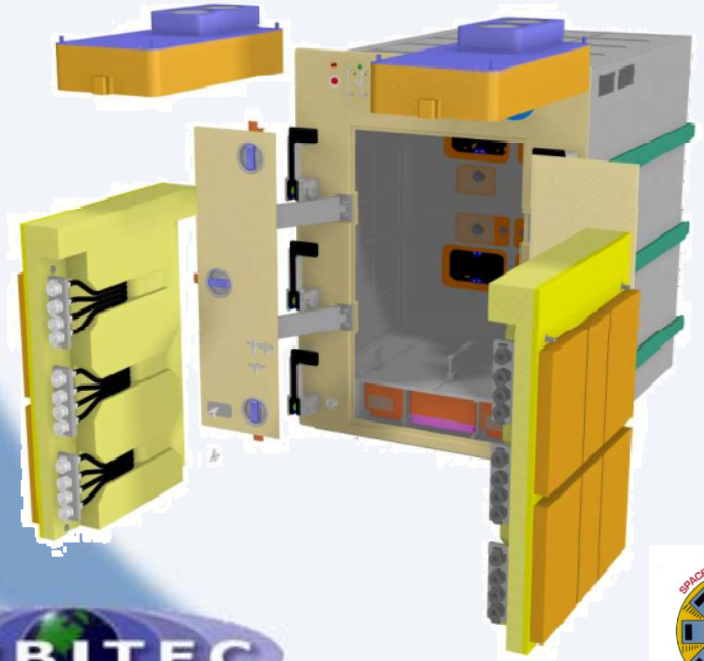
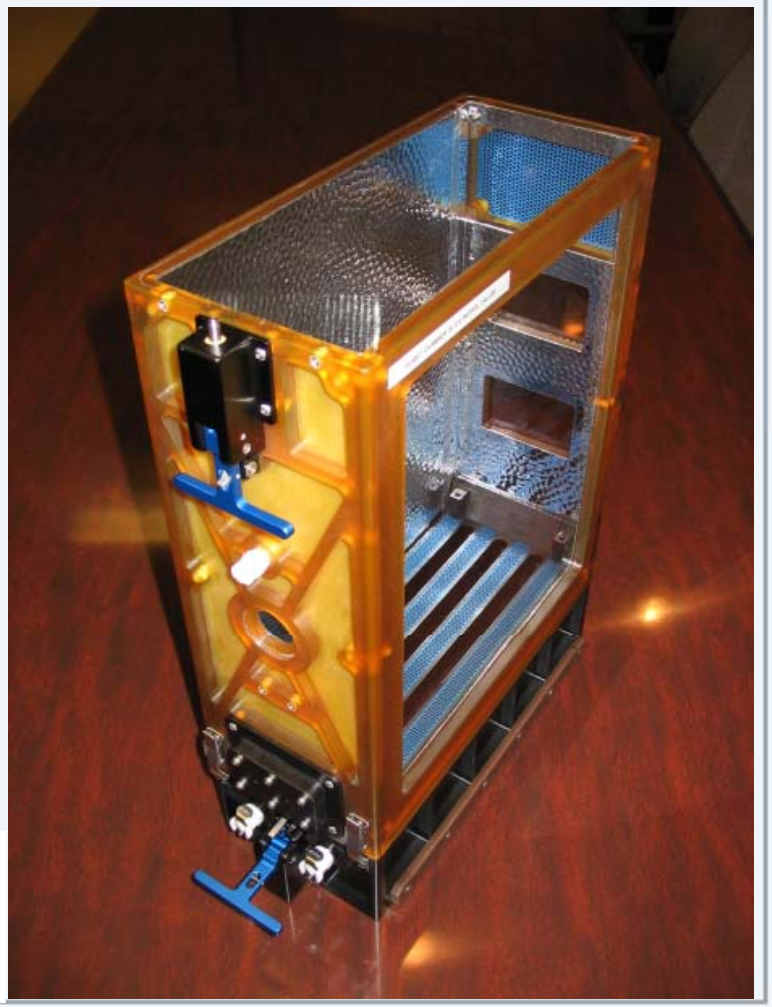
Plant Research Unit (PRU)

- BPS updated with optional chamber configuration
- Solid State Lighting





Science Evaluation Units (SEU's)

AstroGarden

- Flight Heritage - STS 118
- Grown a multitude of crops
- Relatively low cost to flight
- Utilizes ambient lighting, temperature, humidity, and gas concentrations

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AstroGarden

- Recently conducted verification testing for flying aboard ATV
- Submitted safety data package for approval by ESA

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Astrogarden Sample Crops

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Deployable Vegetable Production System (VEGGIE)

- Compact size
- LED based lighting system
- Utilizes ambient gas exchange for temperature, RH, and gas composition

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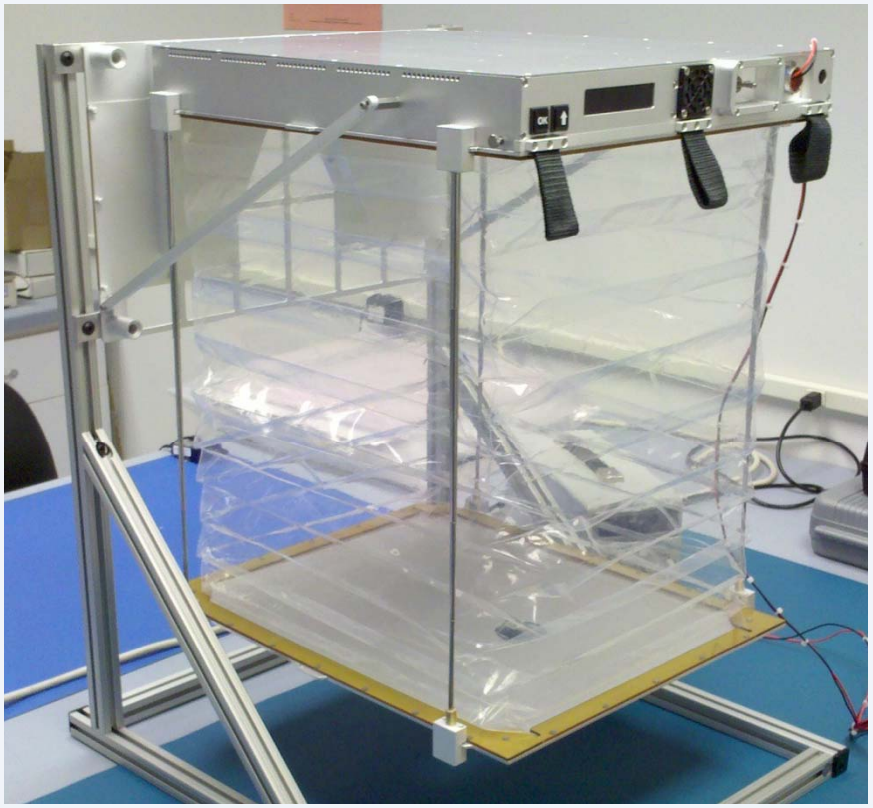
Deployable Vegetable Production System (VEGGIE)

- Collapsible plant growth chamber
  - Supplement crew diet with fresh vegetables
  - Psychological benefit of recreational gardening activity
- Simple, compact system
  - Low mass
  - Low power
  - Minimal stowage volume
- Growth area = 0.17 m^2
- Growth height = 50 cm



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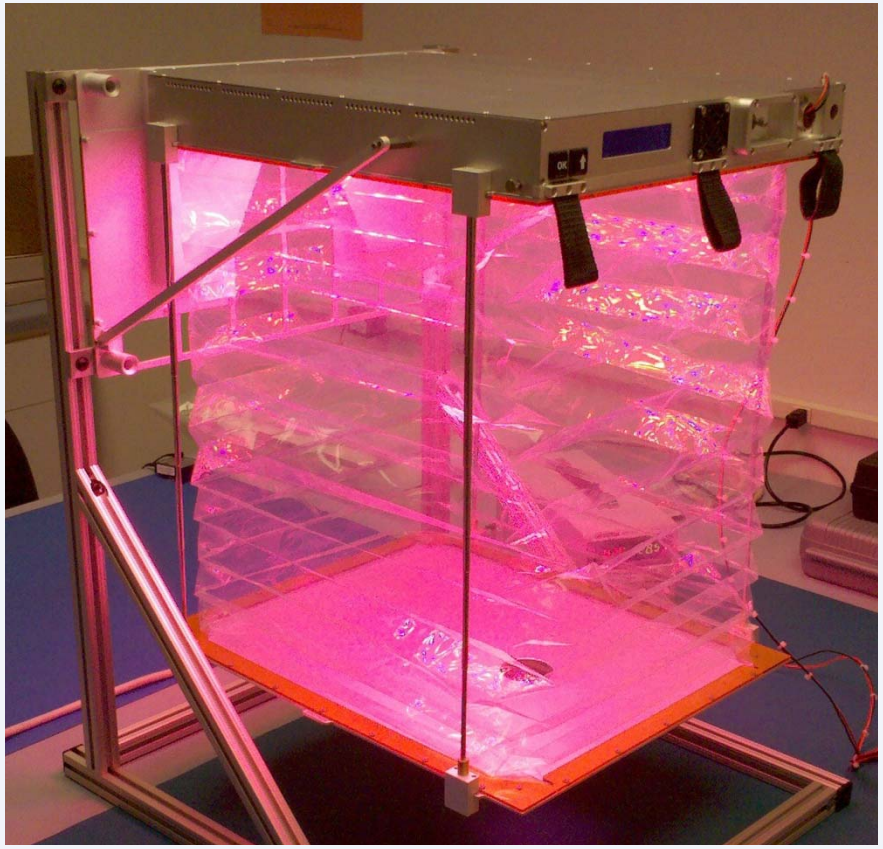
Deployable Vegetable Production System (VEGGIE)

- Light output
  - Red (640 nm)
    - Up to 360 µmole/m^2/s
  - Blue (440 nm)
    - Up to 90 µmole/m^2/s
  - Green (540 nm)
    - 30 µmole/m^2/s available
    - Provides more natural appearance
- Adjustable photoperiod



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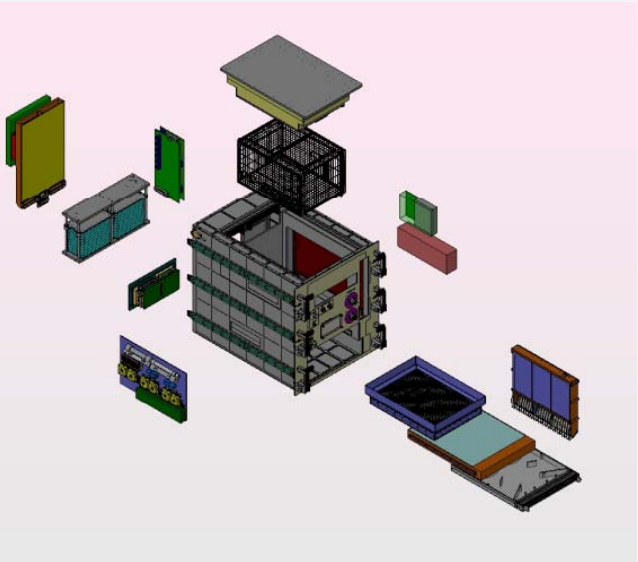
Advanced Animal Habitat (AAH)

- Designed for Rat & Mice experiments
- Built and tested Science Evaluation Unit (Ground based)
- Flight Hardware Designed, most prototyped



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SPACE STATION BIOLOGICAL RESEARCH
NASA – AMES RESEARCH CENTER
ADVANCED ANIMAL HABITAT

AAH Capabilities

Description	AAH
Water Replenish (automated monitoring)	YES
Food Replenish (automated monitoring)	YES
Active Thermal Control	YES
Video Surveillance	YES
Automated Data Collection	YES
Data Communication	YES
Replaceable Filtration	YES
Atmospheric Composition Monitoring	YES
Access to Animals	YES
Programmable Lighting	YES
Habitable Volume	18,261 cm^3
Automated Power Control and Backup	YES

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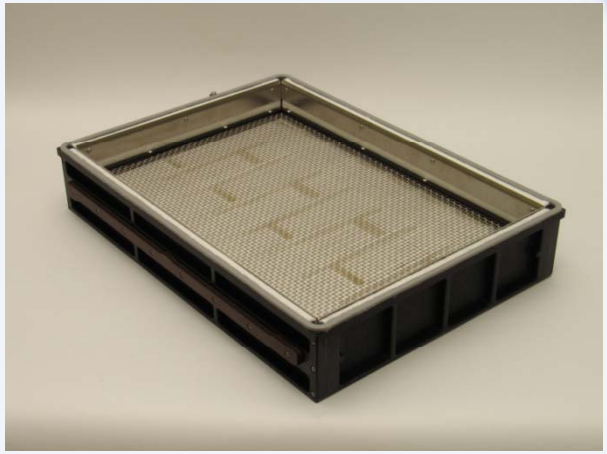
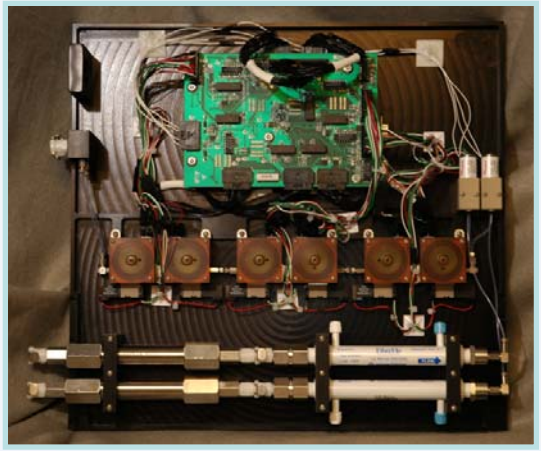
AAH Hardware





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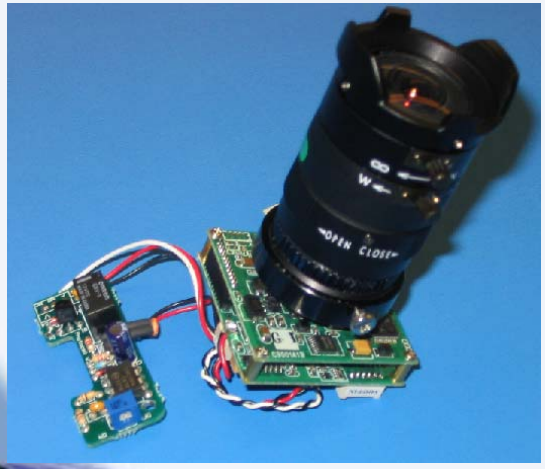
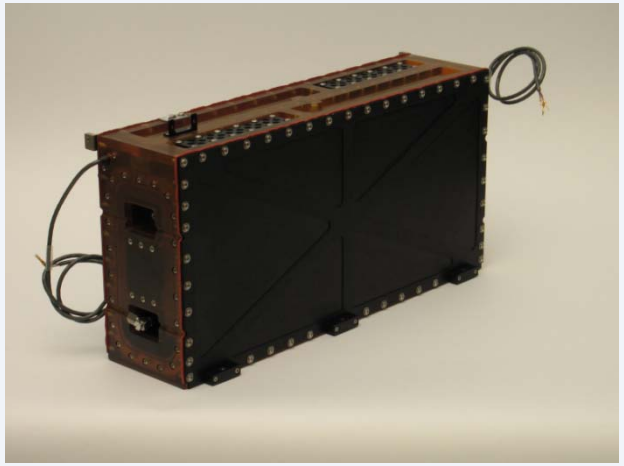
AAH Hardware





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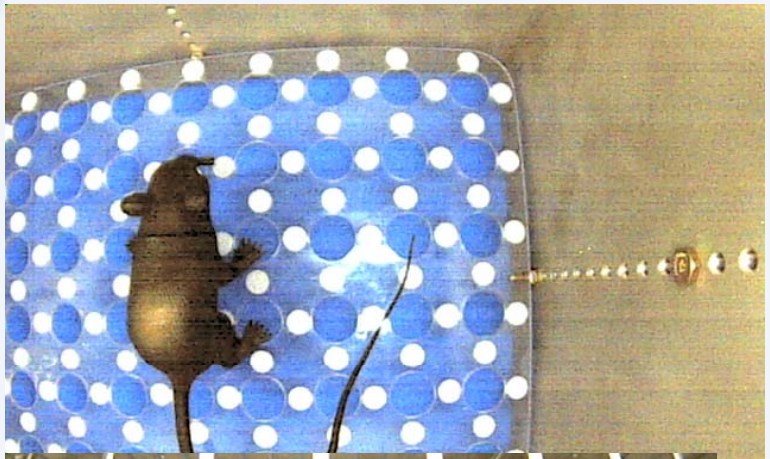
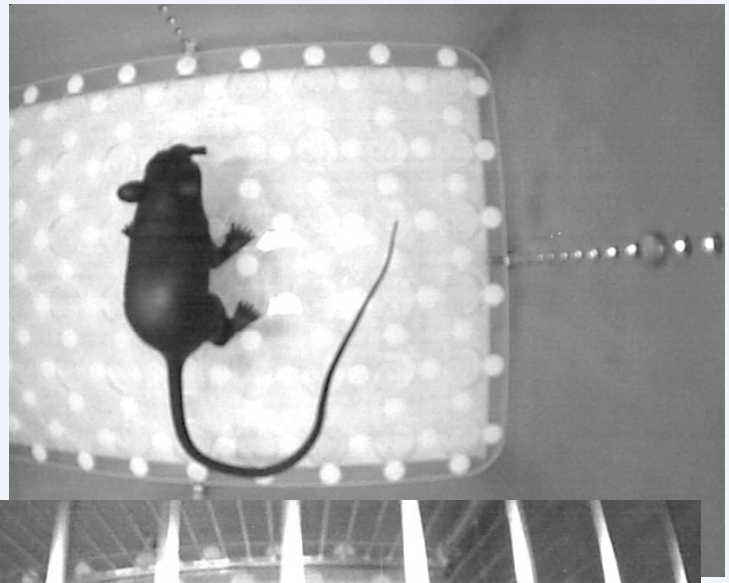
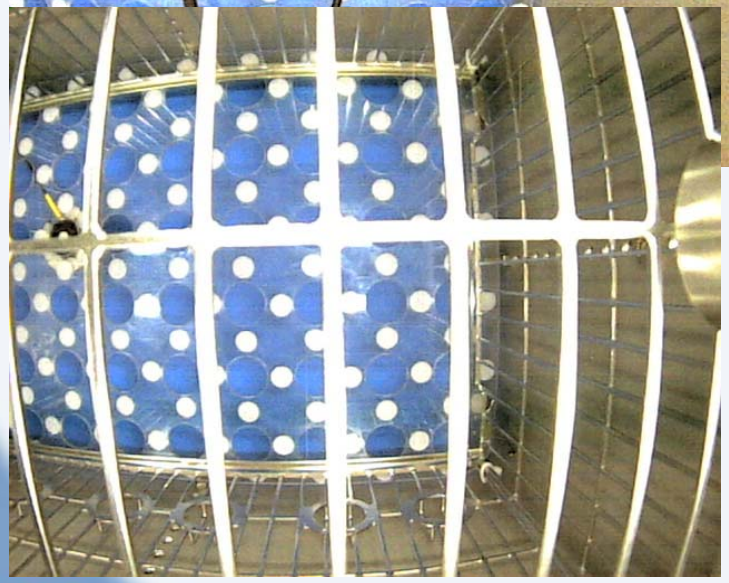
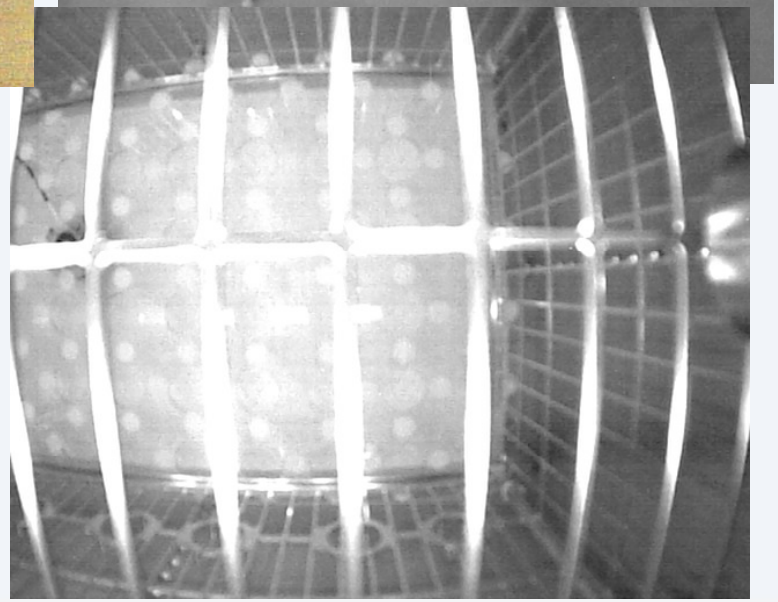
AAH Test Image









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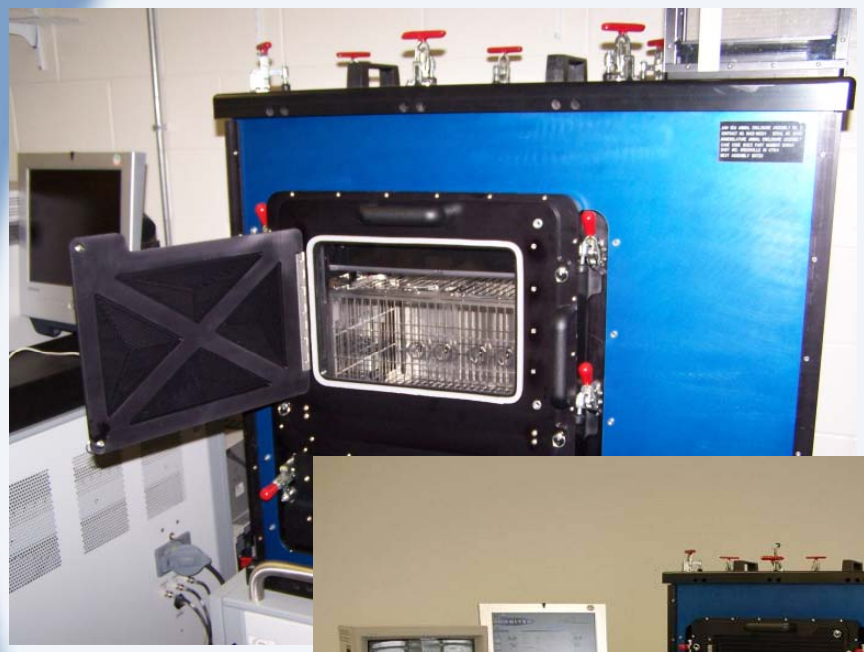
AAH Science Evaluation Unit



- Built and tested Science Evaluation Unit (ground control based testing)

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Solid State Lighting

- Can produce up to 50 µmol/m2/s/Watt
- Spectral control
- Does not require double containment
- Heat rejection simplified

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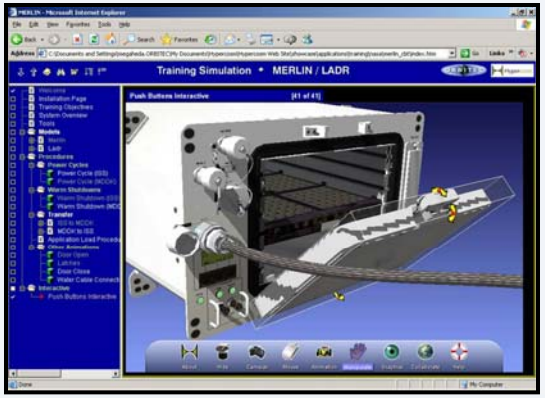
Integration and Operational Support

- Capability to Develop/Modify Hardware
- Provide Integration Support to Achieve Flight Certification
- Provide Operational Support for Both Flight and Ground Systems
- Crew Training

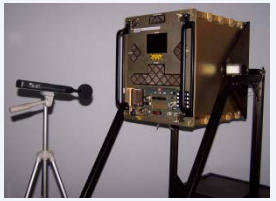



Vibration


Temp. Cycling


Humidity

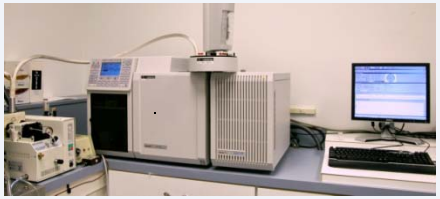

Space Vacuum


Acoustics


Controlled Environment

Gas mixing


Lunar dust


GC/MS