Washer & Dryer Machine in Space

Name of Technology:
Low Mass Low Volume Crew Clothing Systems

Participating NASA Centers:
ARC (Lead); GRC, JSC, KSC, MSFC

Technological Area:
X2.03 Spacecraft Habitation and Waste Management Systems

Vision for the Technology:
Deep Space missions will require crews to have a laundry system that can wash and dry their clothes. The system needs to be compact, lightweight with little or no water usage while sanitizing clothes.

Challenges:
Aboard the International Space Station (ISS), the crew clothing currently accounts for ~1/4 of crew provisions. Having an integrated laundry system will significantly reduce mission mass and volume.

Crew clothing is replaced when it becomes unclean or uncomfortable. There are no cleaning of clothing options available for the crew. The crew uses disposable wipes for hygiene. Clothing is supplied at a rate of 0.21 kg/person/day and wipes are supplied at a rate of 0.11 kg/person/day.

NASA Seeks to Meet the Following Specs:

Success will be determined by:

- Mass of clothing and freshening/cleaning systems <0.1 kg/person/day, mass of cleaning wipes <0.05 kg/person/day
- Low mass reusable or long usage clothing options
- Nonflammable (flame resistant in 32% oxygen environments)
- Low or no outgassing
- Low consumable mass/volumes
- Low acoustic generation
- Low water usage
- Minimal crew time
- On-orbit, Lunar/Martian gravity compatible
- Atmospheric pressures from 8 to 15 psia
- Minimal electrical power
- Non-toxic cleaning agents waste products compatible with biological water processing and atmospheric trace contaminant control

Overview of Student Project:
NASA seeks an innovative washer and dryer to clean crew clothing for Deep Space, Lunar, and Martian missions. The laundry system needs to use little or no water, little electricity, and work in spacecraft environments to clean clothes.

Innovative Areas Student Projects Can Address:

- Develop a lightweight, compact clothes washer/dryer.
- Develop an alternative cleaning system that meets NASA's goals.

Project Phases

I. Conceptual and feasibility study with characteristics

II. Proof of Concept/Prototype in lab environment

Research Funded by NASA on this Topic:

Proposal Number: 171 H3.04-8930
Innovative Laundering and Sanitization System to Extend Duration of Crew Clothing Wear

Proposal Number: 22-1- H3.09-1890
Ultra-Fast Ultrasonic Clothes Washer/Dryer Combination for Moon, Mars and ISS Applications

Proposal Number: 11-2 X3.02-9012
Advanced Microgravity Compatible, Integrated Laundry System

Proposal Number: 12.05-5201
Space Laundry Cleansing Agent and Filter Development

Proposal Number: 94-1 12.06-7077
Closed-cycle Ozone Laundry System for Space Habitat Applications

References:

X2.03 Spacecraft Habitation and Waste Management Systems

H3.04Logistics Reduction

H3.09 Human Accommodations

X3.01Spacecraft Cabin Atmospheric Management and Habitation Systems

X3.02 Crew Accommodations and Waste Processing for Long Duration Missions

NASA Glenn Interns Take Space Washing Machine Designs for a Spin