



TOPIC # - TDC - 102

LUNAR WASHER/DRYER

BACKGROUND

There are no water-based washing or drying systems for clothes on the International Space Station and none are currently planned for long duration human space missions to the Moon and Mars due to the large amount of power, mass, water, and volume needed. Yet astronaut exercise and other clothing needs washing and drying to save on logistics.

<https://spaceref.com/science-and-exploration/photo-running-on-colbert-in-space-2/>

PROBLEM/DESCRIPTION

Design a clothes washer-dryer combo machine derived from existing terrestrial combo washer-dryer technology but optimized to operate in Lunar gravity (1/6 earth-g). Various adjustments may be needed for optimum washing and drying of clothes under reduced gravity conditions. Furthermore, atmospheric pressure in a lunar habitat is expected to be less than here on Earth, so assume 70 kPa for your design, and do not plan to exhaust hot, humid air from the machine to the cabin (minor leakage is OK). Minimize mass, power, machine volume, water usage, and overall time to launder clothes. Design goals are given in the table. Clothes must not come out of the machine damp.

Terrestrial examples of combo machines: <https://www.lg.com/us/washers-dryers/lg-luwm101hwa-washer-dryer-combo-lgsignature> <https://www.geappliances.com/ge/connected-appliances/ultrafast-2-in-1-washer-dryer-combo>

Criteria	Design Goal
Machine Capacity	Up to 4.5 kg of clothing at a time
Water Use	20 kg of total water use per load
Power	750 watts
Machine Mass	50 kg
Machine Volume	0.3 cu. meters
Wash and Dry Time	10 hours

DELIVERABLES

Report or presentation describing preliminary design of the system, including dimensioned drawings and/or CAD output. Design should be supported by calculations indicating performance as well as mass, volume and power characteristics. A description of differences between the lunar washer/dryer and one designed for Earth should be presented. A concept of operations and estimate of crew time to wash/dry a load of clothes should be included.

DESIGN TEAM PROFILE

NASA MENTOR:	Michael Ewert (michael.k.ewert@nasa.gov)
LEVEL:	Undergraduate students of any level
MAJOR/DISCIPLINE:	ME, Electrical Engineering, Aeronautical Engineering
TEAMS:	1
DURATION:	One or Two-Semester Project

