

Acronym: UMS

Title: Urine Monitoring System

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Developer(s): Johnson Space Center, Human Research Program, Houston, TX

Sponsoring Agency: National Aeronautics and Space Administration (NASA)

Increment(s) Assigned: 19, 20

Mission Assigned: N/A

Brief Facility Summary (PAO): The Urine Monitoring System (UMS) is a system designed to collect an individual crewmember's void, gently separate urine from air, accurately measure void volume, allow for void sample acquisition, and discharge remaining urine into the Waste Collector Subsystem (WCS) onboard the International Space Station.

Facility Summary:

- The Urine Monitoring System (UMS) is a successor design to the existing Space Shuttle system and will resolve anomalies such as: liquid carry-over, inaccurate void volume measurements, and cross contamination in void samples.

- The crew will perform an evaluation of airflow at the ISS UMS urinal hose interface, a calibration evaluation, and a full user interface evaluation.
- The UMS can be used to facilitate non-invasive methods for monitoring crew health, evaluation of countermeasures, and implementation of a variety of biomedical research protocols on future exploration missions.

Detailed Facility Description: The International Space Station (ISS) Urine Monitoring System (UMS) is an upgrade to the previous Space Shuttle system. The UMS is capable of collecting and accurately measuring void volume, separating urine from air, and allowing acquisition of individual, uncontaminated urine samples from ISS crewmembers. The UMS is designed to operate in conjunction with the airflow of the Waste Collector Subsystem (WCS) of the ISS; the hardware consists of a laptop computer and a mechanical module. The laptop will be the primary crew interface, while the mechanical module contains a liquid/air separator, a motor, solenoid valves, fluid plumbing and the sample acquisition port. While deployed, the mechanical module will reside in the Waste and Hygiene Compartment in the U.S. Laboratory Module, *Destiny*.

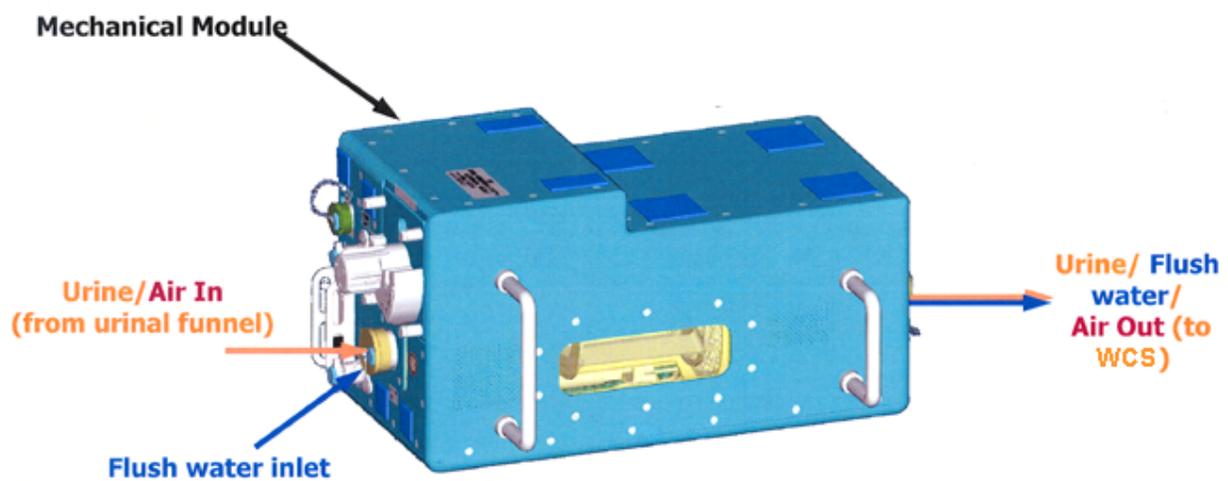
During the equipment checkout, the UMS hardware will be functionally tested to determine its efficacy at eliminating liquid carry-over between cycles, inaccurate void volume measurements, and cross contamination in void samples. Samples obtained as part of the checkout will be returned aboard STS-129/ULF3 for postflight analysis. Once proper functioning has been verified, the UMS will be available for use by experiments that require urine collection.

A safe, accurate and reliable means of obtaining representative urine samples and total void volume measurements from the ISS crewmembers is essential to human research. Use of the UMS will substantially reduce the launch mass and volume of consumables required for urine collection, eliminate the need for on-orbit stowage and disposal of large quantities of leftover urine, avoid the loss of urine to the water reclamation system when urine samples are required, resolve gender issues with the current system, and provide ease of operation.

The UMS will also facilitate the performance of future investigations requiring urine sample collection by automatically measuring void volume which is required to enable future real-time analysis of samples. On-orbit analysis would reduce the number of samples requiring return to Earth and provide more timely results to investigators and feedback to medical personnel regarding crew health.

Project Type: Facility

Images and Captions:



Computer generated depiction of the Urine Monitoring System (UMS). Image courtesy of the Johnson Space Center, Human Research Program, Houston, TX

Operations Location: ISS inflight

Brief Facility Operations:

- The crew will install and activate the ISS UMS. One crewmember will act as both operator and subject to perform UMS tasks.
- The crewmember will perform evaluation exercises for air flow, calibration, and user interface.
- Samples from the calibration exercises and from the user interface evaluations will be returned to ground for additional analysis.

Operations: The crew will install and activate the ISS UMS. One crewmember will act as both operator and subject to perform the following tasks:

- **Airflow evaluation** will demonstrate existence of proper airflow at the ISS UMS urinal hose user interface. The operator will insert a male funnel at ISS UMS urinal hose, verify nominal urine prefilter is installed, and activate the ISS UMS. Once the ISS UMS is ready to accept liquid, the operator will inject water into funnel from approximately 1 to 2 inches (2.5 to 5.1-cm) away utilizing the personal hygiene hose.
- **Calibration evaluation** is intended to gain thorough separator bowl pressure readings for: pressure versus volume calibration and precise and accurate individual void volume measurements. The operator will inject each pre-filled calibration syringe into the ISS UMS urinal hose, simulating various micturition (urination) volumes. Certain calibration syringes will be injected one per cycle and treated as single micturitions, while others will be injected in sets per cycle. The operator will also acquire samples for postflight analysis. One set of calibration syringes will be utilized upon ISS UMS activation (checkout start) and one set of calibration syringes are to be utilized prior to ISS UMS deactivation (checkout end) A total of thirty-four calibration syringes will be utilized for the evaluation.
- **Full user interaction evaluation:** will involve participating crewmember to utilize the ISS UMS during nominal micturition in lieu of direct WCS utilization. Crewmembers will complete a nominal ISS UMS cycle for each micturition, including acquisition of a sample for postflight analysis. All micturitions in a day for five mission days is planned.

Category: Facilities

Subcategory: Small Hardware

Manifest Status: Ongoing

Availability: Developed for ISS

Previous Missions: The UMS is a successor design to the existing Space Shuttle Urine Monitoring System, which flew on seven Shuttle flights after its initial development in 1979.

Supporting Organization: Exploration Systems Mission Directorate (ESMD)

Web Sites:

ISS UMS GFE Website

http://ea.jsc.nasa.gov/eawebfiles/ea-projects/flightgfe/ISS_UMS/html/ISS_UMS.htm