



# Environmental Control and Life Support Systems

Johnson Space Center (JSC) is the world leader in human spaceflight for environmental control and life support systems, including waste management and air revitalization, water recovery, and regeneration systems. JSC personnel have unique experience in the areas of air quality, potable water, urine monitoring, regenerative fluids, and hygiene activities. The Center offers expertise in design, development, test, and maintenance of hardware to provide potable water aboard the International Space Station and future spacecraft. The air revitalization team provides research, development, test, and maintenance of systems that create a livable cabin atmosphere for spaceflight applications. Capabilities include evaluation of air revitalization technology in the functional areas of carbon dioxide (CO<sub>2</sub>) removal, CO<sub>2</sub> reduction, oxygen (O<sub>2</sub>) generation, and trace contaminant control.

## Services Provided

- Environmental control and life support system testing
  - Metabolic loading to life support systems
  - Parametric testing
- Air Revitalization System testing
  - CO<sub>2</sub> removal/reduction
  - O<sub>2</sub> generation
  - Trace contaminant control
- Water systems test, analysis, and development
  - Wastewater Collection and Transportation System (WWCTS)
  - Biosafety level 2 microbiology laboratory
- Microbiology and wastewater test and analysis



## Air Revitalization Systems

### Air Revitalization Technology Evaluation Facility

The facility provides the capability to accommodate several independent test articles simultaneously, as well as integrated hardware evaluations of multiple components. The facility can accommodate end-to-end operation and long-term testing of integrated Air Revitalization (AR) subsystems. The facility provides gaseous CO<sub>2</sub>, nitrogen (N<sub>2</sub>), and O<sub>2</sub>. Multiple vent lines and a deionized water source are available.

### Gas Analysis Laboratory

The Gas Analysis Laboratory provides analytical capabilities in support of air revitalization. Analyses performed include qualitative and quantitative analyses of trace components, moisture measurements, chemical identification, and contamination analysis. Additionally, facility personnel have the capability to analyze many liquids, polymers, and other solid substances.

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## Water Recovery Systems

### Advanced Water Recovery Systems Development Facility (AWRSDF)

The AWRSDF provides a test area for all facets of spacecraft water recovery systems, including

- Wastewater pretreatment
- Brine water recovery
- Water filtration
- Primary processor technologies
- Post processors
- Personal hygiene studies

### Water Analysis Laboratory

A water analysis laboratory provides water sample analysis, including examination of physical properties, quantification of metal content, and quantification of organic and inorganic content. Analyses include

- pH and conductivity
- Total nitrogen, iodine, chlorine, phosphates, ammonium, and many other ions
- Absolute color, alkalinity, metals
- Total organic carbon and total inorganic carbon
- Turbidity, surface tension
- Dissolved oxygen and chemical oxygen demand

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## Altitude Testing

Facility	Internal Volume	Pressure Range	Features
8-Foot Chamber	8' Dia x 14' L	1 x 10 <sup>-2</sup> – 760 torr	Human metabolic simulator for Life support systems
11-Foot Chamber	11' Dia x 19' L	1 x 10 <sup>-2</sup> – 760 torr	Advanced life support systems testing
Space Station Airlock Test Article	Equipment lock: 1,100 ft. <sup>3</sup> Crew lock: 310 ft. <sup>3</sup> Observer lock: 1,570 ft. <sup>3</sup>	1 x 10 <sup>-2</sup> – 760 torr	Pre-breathe protocol evaluation
20-Foot Chamber	20' Dia x 27.5' H	1 x 10 <sup>-2</sup> – 760 torr	Long-duration habitability and life support equipment and systems testing

We have developed customer-friendly agreements to streamline business relationships and are eager to share our unique facilities and expertise with new customers. We invite your inquiries regarding application or adaptation of our capabilities to satisfy your special requirements. Briefings on general or specific subjects of mutual interest can be arranged at JSC or at your business site.

### Facility Testing Information

<http://jsceng.nasa.gov>

### Point of Contact

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