Monitoring technologies are employed to assure that the chemical and microbial content of the air and water environment of the astronaut crew habitat falls within acceptable limits, and that the chemical or biological life support system is functioning properly. The sensors may also provide data to automated control systems.

Significant improvements are sought in miniaturization, accuracy, precision, and operational reliability, as well as long life, real-time multiple measurement functions, in-line operation, self-calibration, reduction of expendables, low energy consumption, and minimal operator time/maintenance for monitoring and controlling the life-support processes.

- For water monitoring, sensitive, fast response, online analytical sensors to monitor suspended liquid droplets, dispersed gas bubbles, and water quality, particularly total organic carbon.

- Other species of interest include dissolved gases and ions, and polar organic compounds such as methanol, ethanol, isopropanol, butanol, and acetone in water reclamation processes; and particulate matter, major constituents (such as oxygen, carbon dioxide, and water vapor) and trace gas contaminants (such as ammonia, formaldehyde, ethylene) in air revitalization processes. Both invasive and noninvasive techniques will be considered.

- Monitoring of microbial species, especially pathogens, primarily in water, is important. Enabling technologies may include proper sample preparation and handling, with minimal operator effort and minimal or no reagent usage.

- Significant mass savings and ease of use may be enabled by approaches that detect more than one species at a time. Proposals that seek to develop new technologies or combine existing technologies to simultaneously monitor several major constituents and/or trace constituents are of interest.