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With aid of Dragon, a busy year for life sciences

by Joe Chambliss

*The **Life Sciences and Systems Technical Committee** advances technologies required to keep people healthy and safe as they explore space.*

The life sciences and systems community is actively conducting aerospace-related efforts focused on enabling human exploration of space.

Members worked with the American Society for Gravitational and Space Research to educate Congress about several issues regarding life and physical science research.

The **T-Cell Activation in Aging** experiment, also known as NIH1a for its sponsor the National Institutes of Health, was returned to Earth in May aboard a SpaceX Dragon capsule after a month in orbit. The payload, developed by Kayser Italia for the European Space Agency, investigated the diminishment of T-cell activation in astronauts related to aging. The experiment was refurbished and scheduled to be delivered to the station again on the SpaceX-5 mission in December.

The Italian Space Agency, ESA and NASA have completed an accommodation study to ensure that the space station's **Advanced Resistive Exercise Device**, an exercise machine for ISS astronauts, can be connected to a system called ELITE for the Elaboratore Immagini Televisive, which records the movements of astronauts.

The CELLBOX experiment has been delivered to NanoTacks LCC of Webster, Texas.

An important set of experiments are in preparation for the ESA's Italian astronaut Samantha Cristoforetti.

In August, NASA completed a closed chamber test at the Marshall Space Flight Center to demonstrate operation of the ISS-derived **Atmosphere Revitalization Systems** life support equipment in evolved configurations for the purpose of increasing reliability, reducing mass and improving performance. Preliminary results included an increased reliability of the Oxygen Generation Assembly and reduced system weight, and operational changes show that the Carbon Dioxide Removal Assembly can reduce cabin CO2 levels to a partial pressure of 2 Torr for a four-person crew, compared with the ISS baseline of 3.8 Torr, with configuration and minimum material changes. An advanced Trace Contaminant Control configuration demonstrated the ability to reduce contaminants such as Siloxanes in water condensate to potentially improve performance and longevity of water processor components. The final phase of the test consisted of installing development environmental monitoring equipment from NASA's Jet Propulsion Lab into the E-chamber at NASA's Marshall Space Flight Center, exposing them to elevated levels of selected contaminates and comparing results to laboratory standard equipment. The tests were supported by NASA Ames, the Glenn Research Center, JPL, the Johnson Space Center and the Kennedy Space Center.

The Advanced Exploration Systems Water Recovery Project made advances in development of **water processing technologies** for exploration including testing and design of the Cascade Distillation System — CDS — urine processor prototype 2.0 through preliminary design review, development of less toxic or green urine pre-treatment, design of a urine brine processor and research into the use of silver as a biocide. The team also completed manufacturing a thermoelectric heat pump for the CDS. The heat pump provides heating and cooling for the multistage evaporation and condensation process that the CDS uses to recover purified water from wastewater.

The **Inspiration Mars** concept to send two people on a free-return trajectory around Mars in 501 days ran into political realities of approval on Capitol Hill. This has pushed the mission to adopt a later launch opportunity that stretches the mission duration to 580 days and includes flybys of both Mars and Venus. The 15 percent increase in mission duration makes the Life Support System task even more challenging but still achievable utilizing the existing system architecture and technologies. The IM Life Support technology test bed at Paragon Space Development Corp. was brought online and all primary Inspiration Mars regenerative life support technologies completed one week of bench-top testing to verify performance and readiness to conduct follow-on integrated long-term testing.

As a result of equipment delivered by April's SpaceX-3 Dragon flight, the ISS's powered locker locations have been increased from two to six, and the cold stowage team at NASA Johnson provided a 180 percent increase in the amount of temperature-sensitive science achievable on the station.

The Unmanned Pressure Integrated Suit Test team completed a test series of varying configurations and pressures with the development Orion air revitalization loop and Modified Advanced Crew Escape Suits.

The Orion Environmental Control and Life Support System/Suit Intermediate Pressure Suit Test was completed as part of a series of manned Orion suit loop tests, the first full closed loop test series done since Apollo. The tests incorporated suits modified for Orion launch and entry, as well as new Orion systems.

NASA's Atmosphere Revitalization Systems test chamber is readied for integrated testing.

NASA

Expedition 39 flight engineer and NASA astronaut Steve Swanson activates the Veggie plant growth system and Veg-01 experiment in the ISS in May.