The Exploration Systems architecture presents cryogenic storage, distribution, and fluid handling challenges that require new technologies to be developed. Reliable knowledge of low-gravity cryogenic fluid management behavior is lacking and yet is critical for future manned and robotic exploration in the areas of storage, distribution, and low-gravity propellant management. Additionally, Earth-based and planetary surface missions will require success in storing and transferring liquid and gas commodities in applications. Some of the technology challenges are for long-term space use cryogenic propellant storage and distribution; cryogenic fluid ground processing and fluid conditioning; liquid hydrogen and liquid oxygen liquefaction processes on the lunar surface. Furthermore, specific technologies are required in valves, regulators, instrumentation, modeling, mass gauging, cryocoolers, and passive and active thermal control techniques. The technical focus for component technologies are for accuracy, reduced mass, minimal heat leak, minimal leakage, and minimal power consumption. The anticipated technologies proposed are expected to increase safety, reliability, economic efficiency over current state-of-the-art cryogenic system performance, and are capable of being made flight qualified and/or certified for the flight systems and dates to meet Exploration Systems mission requirements.

Subtopics

X10.01 Cryogenic Fluid Management Technologies

Lead Center: GRC
Participating Center(s): ARC, JPL, JSC, KSC, MSFC, SSC