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ABSTRACT: Human Exploration System Test-bed for Integration and Advancement (HESTIA) Support of Future NASA Deep-Space Missions

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The Engineering Directorate at the NASA - Johnson Space Center is outfitting a 20-Foot diameter hypobaric chamber in Building 7 to support future deep-space Environmental Control & Life Support System (ECLSS) research as part of the Human Exploration System Test-bed for Integration and Advancement (HESTIA) Project. This human-rated chamber is the only NASA facility that has the unique experience, chamber geometry, infrastructure, and support systems capable of conducting this research.

The chamber was used to support Gemini, Apollo, and SkyLab Missions. More recently, it was used to conduct 30-, 60-, and 90-day human ECLSS closed-loop testing in the 1990s to support the International Space Station and life support technology development.

NASA studies show that both planetary surface and deep-space transit crew habitats will be 3-4 story cylindrical structures driven by human occupancy volumetric needs and launch vehicle constraints. The HESTIA facility offers a 3-story, 20-foot diameter habitat consistent with the studies' recommendations.

HESTIA operations follow stringent processes by a certified test team that including human testing. Project management, analysis, design, acquisition, fabrication, assembly and certification of facility build-ups are available to support this research. HESTIA offers close proximity to key stakeholders including astronauts, Human Research Program (who direct space human research for the agency), Mission Operations, Safety & Mission Assurance, and Engineering Directorate.

The HESTIA chamber can operate at reduced pressure and elevated oxygen environments including those proposed for deep-space exploration. Data acquisition, power, fluids and other facility resources are available to support a wide range of research.

Recently completed HESTIA research consisted of unmanned testing of ECLSS technologies. Eventually, the HESTIA research will include humans for extended durations at reduced pressure and elevated oxygen to demonstrate very high reliability of critical ECLSS and other technologies.