

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures I - Development and Verification (Space Vehicles and Components) (1)

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CAPABILITIES, DESIGN, CONSTRUCTION AND COMMISSIONING OF NEW VIBRATION,
ACOUSTIC AND ELECTROMAGNETIC CAPABILITIES ADDED TO THE WORLDS LARGEST
THERMAL VACUUM CHAMBER AT NASA'S SPACE POWER FACILITY

Abstract

NASA's human space exploration plans developed under the Exploration System Architecture Studies in 2005 included a Crew Exploration Vehicle launched on an Ares I launch vehicle. The mass of the Crew Exploration Vehicle and trajectory of the Ares I coupled with the need to be able to abort across a large percentage of the trajectory generated unprecedented testing requirements. A future lunar lander added to projected test requirements. In 2006, the basic test plan for Orion was developed. It included several types of environment tests typical of spacecraft development programs. These included thermal vacuum, electromagnetic interference, mechanical vibration, and acoustic tests. Because of the size of the vehicle and unprecedented acoustics, NASA, conducted extensive assessment and as result, chose to augment the Space Power Facility at NASA Plum Brook Station, of the John H. Glenn Research Center to provide the needed test capabilities. The augmentation included designing and building the World's highest mass capable vibration table, the highest power large acoustic chamber, and adaptation of the thermal vacuum chamber as a reverberant electromagnetic interference test chamber. These augmentations were accomplished from 2007 through early 2011. Acceptance testing occurred in spring 2011 and commissioning is underway in summer 2011. This paper provides an overview of the capabilities, design, construction and commissioning of this extraordinary facility.