Poster Session (P)
Poster Lunch (1)

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ACOUSTIC DESIGN OF PRESSURIZED MODULE UNDER ON-ORBIT VIBRO-ACOUSTIC ENVIRONMENT

Abstract

Acoustic environment inside the on-orbit pressurized modules can pose significant effects on the crew, excessive noise can reduce the effectiveness and efficiency of communication, disturb rest and sleeping, and even cause permanent hearing loss, therefore a safe acoustic environment is a basic requisite for the crew. The pressurized module internal acoustics results from the contributions of all noise and vibration disturbance sources through complex vibro-acoustic transmission paths, which makes acoustic control a system design. In order to mitigate the risks of excessive accumulation of noise, an iterative analysis and test approach, which involves noise requirement allocation, acoustic design, simulation and verification tests, is adopted. Specific design processes have been carried out. Noise control requirements are established for disturbance source equipment, which primarily include hardware from the environment control and life support system (ECLSS), thermal control system (TCS), compressor and control moment gyro (CMG). Passive noise control approaches, such as acoustic box, pipe mufflers, fan inlet and outlet mufflers, crew quarter noise isolation and absorption, vibration isolator, etc., are developed at varying levels, and the database of disturbance sources in terms of noise radiation and vibration characteristics is set up. The vibro-acoustic model of a module based on statistical energy analysis (SEA) approach is established, where the effects of noise control treatments at varying levels are reflected appropriately. The noise level inside the module is predicted, based on which the source making severe noise contribution and the main noise transmission paths are identified, and accordingly, the complement acoustic treatment is designed and its effect is assessed.