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MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Vehicles – Mechanical/Thermal/Fluidic Systems (7)

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DESIGN, BUILD AND EXPERIMENTAL STUDY OF EMERGENCY POWER ASSIST SYSTEM

Abstract

Fluid viscous damping systems are well suited for many air vehicles subjected to shock and vibration. These damping system works in the principle of viscous fluid throttling through the orifice to create huge pressure difference between compression chamber and rebound chamber and obtain the required damping force. One application of such systems is its use in aircraft door system to counteract the door's velocity and safely stop it. In emergency condition like crash landing or emergency landing where the door doesn't open easily possibly due to unusually tilting of fuselage or some obstacles or intrusion of debris obstruction to move the parts of the door, such hydraulic system can be combined with other systems to provide needed force to forcefully open the door and also securely stop it at the same time within the given time frame generally 3 to 6 s. In the present study, a type of hydraulic system known as snubber along with other systems like actuator, gas bottle, time delay valve altogether known as emergency power assist system (EPAS) is designed, built and experimentally studied. Several performance tests results of snubber, gas bottle and time delay valve are presented. Also, the EPAS system is installed in the suspension arm of the aircraft door and is studied explicitly performing some parametric changes. The pressure from the gas bottle is given to the actuator and then to the snubber to operate the emergency opening of the door. Several parameters such as oil level, oil viscosity, bypass valve gap are changed in the snubber and the EPAS is tested to check the magnitude of damping force along with the time required to effectively open the door. The results are evaluated and conclusions are made comparing with the results from the experiment of previous EPAS design. It is found that the new design has significant improvement over the old one in terms of uniform damping force, realization of damping at low pressure and door opening time in emergency and manual condition.