

Parametric Investigation of Aircraft Door's Emergency Power Assist System (EPAS)

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Abstract : Fluid viscous damping systems are well suited for many air vehicles subjected to shock and vibration. These damping system work with the principle of viscous fluid throttling through the orifice to create huge pressure difference between compression 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 exigency situations like crash 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 system can be combined with other systems to provide needed force to forcefully open the door and also securely stop it simultaneously within the required time i.e. less than 8seconds. In the present study, a hydraulic system called snubber along with other systems like actuator, gas bottle assembly which together known as emergency power assist system (EPAS) is designed, built and experimentally studied to check the magnitude of angular velocity, damping force and time required to effectively open the door. Whenever needed, the gas pressure from the bottle is released to actuate the actuator and at the same time pull the snubber's piston to operate the emergency opening of the door. Such EPAS installed in the suspension arm of the aircraft door is studied explicitly changing parameters like orifice size, oil level, oil viscosity and bypass valve gap and its spring of the snubber at varying temperature to generate the optimum design case. Comparative analysis of the EPAS at several cases is done and conclusions are made. It is found that during emergency condition, the system opening time and angular velocity, when snubber with 0.3mm piston and shaft orifice and bypass valve gap of 0.5 mm with its original spring is used, shows significant improvement over the old ones.

Keywords : aircraft door damper, bypass valve, emergency power assist system, hydraulic damper, oil viscosity

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