

SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES (D6)
Commercial Space Flight Safety and Emerging Issues (1)

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WHOLE COMMERCIAL SPACECRAFT VIBRATION ISOLATION

Abstract

During the launch, random vibration, sinusoidal vibration and shock are common but uncomfortable. Since most payloads (spacecrafts) are unmanned, the mechanical reliability of components and subsystems is the top concern for designers, rather than how comfortable a passenger would feel when taking the spacecraft. However, in manned spacecraft mission, especially in commercial space flight, comfort is of great importance. Meanwhile, astronauts are chosen for the limitation tolerance of mankind, but customers could rarely bare the environment. One of the methods to improve the comfort is vibration isolation.

Whole spacecraft vibration isolation has been studied for years, one of the experiments occurs on Minotaur I Rockets. By using soft material for multidirectional traction to prevent rigid connection, the payloads are less influenced by high frequency vibration. The effort is significant and it deserves further experiment on manned spacecraft. But before it becomes commercial, the following four steps are proposed and the first three steps have been tested:

1. Choosing appropriate manned spacecraft model, which has enough flight data to prove its reliability;
2. Using mechanic finite-element analysis to analysis different types of vibration isolation structures;
3. Validate the result by testing data ex. the PSD (Power Spectrum Density) of the structures using vibration platform;
4. Test on real flights to ensure the reliability.