3 Stage Vibration Isolation for Unmanned Aerial Vehicle

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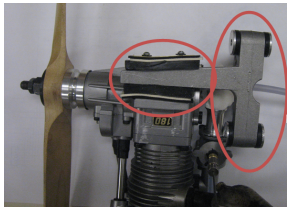
Laser targeting systems implemented on Unmanned Aerial Vehicles (UAV) such as the TASE Gimbal depend on the accuracy of instruments such as accelerometers, gyroscopes, pressure sensors, and Global Positioning System (GPS) to determine accurately the position and distance to target. These instruments almost always required vibration isolation. When measuring and determining position to target, a highly stable surface must be maintained upon which to mount the targeting system. Any vibrations coupled into the mechanical structure of the TASE Gimbal will result in displacement and position noise and ultimately in the inability of the instrument to accurately determine the position of the target. Therefore, it is essential to design and implement a vibrations isolation system that will allow for proper operation of such instruments.

Objective

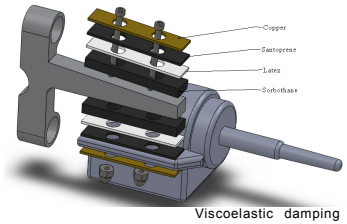
Vibration Isolation Design

Vibration Absorbers



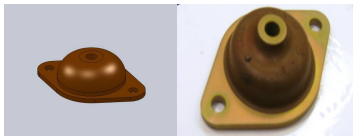
Vibration absorbers consisted in the addition of a second vibration isolation stage added to the primary vibration isolation system. The major outcome of adding the second isolation system is to change from a single degree of freedom to a two-degree of freedom system. This new system now has two natural frequencies; the added system is namely called or referred to as the absorber

Viscoelastic Damping Treatments



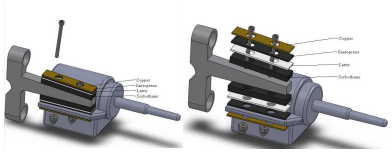
Viscoelastic damping treatments implemented in the vibration isolation system to effectively reduce vibrations. The damping treatment consisted of layers of ultra-soft polyurethane, latex, santoprene and copper plates to form a structure that has both stiffness for static loading and damping to reduce the vibrations.

Broad Temperature Range (BTR) Elastomer Mounts

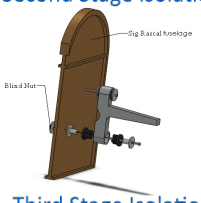


Broad Temperature Range (BTR) elastomer mounts (above), which were found to be of the optimum material given the base vibrations experienced by the gimbal mount. These special mounts separated the TASE Gimbal mount from the Sig Rascal fuselage. Four BTR elastomer mounts were used to support the bottom of the TASE Gimbal mount.

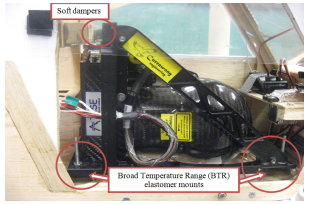
Isolation Implementation



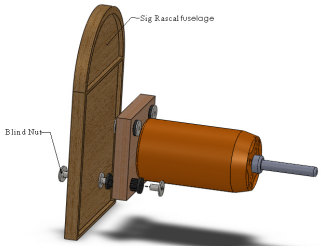
Second Stage Isolation



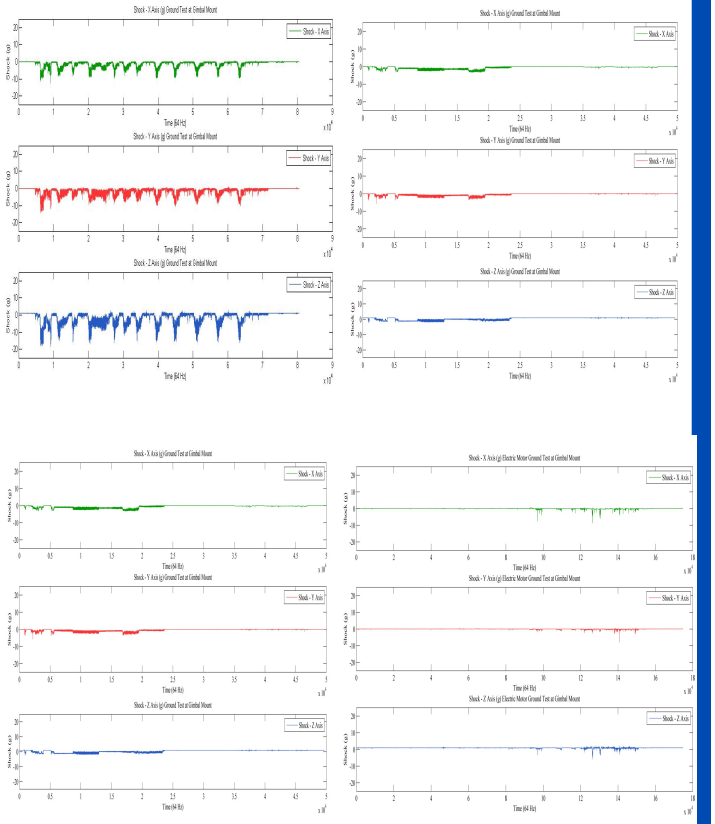
Third Stage Isolation



Electric Motor Isolation



Performance of Isolation System



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