The Mechanics of Engine Mounts

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Parker LORD engine mounts have been around since the 1930s and were featured on some of the first aircraft. Over the years, our designs have evolved to the elastomeric engine mounts seen today in a vast number of applications throughout the general aviation community.

Why use our elastomeric engine mounts? Our mounts are very simplified solutions with few parts, allowing for quick and easy installation.

We optimize system responses to control the motion of both the engine and the mounts using a wide variety of stiffnesses and configurations. By doing this and by altering the properties of the elastomer, we achieve better vibration isolation.

In addition, various application requirements (i.e., temperature, loading conditions, engine characteristics, etc.) are considered to account for details like fluid effects and tuning systems to target frequencies.

Engine mount kits

Parker LORD General Aviation Engine Mounts are packaged as a kit or assembly which includes three components: two bonded (“sandwich”) mounting halves and one spacer component. Additional components may be included depending on the kit.

Our mounting kits feature four different types of spacer components:

- Straight spacer: a metal spacer used as a structural

- Straight spacer: a metal spacer used as a structural component with no added isolation.
- Bicycle pedal spacer: a rectangular-shaped spacer with elastomeric material wrapped around the metal inner component. Used to introduce additional stiffness depending upon what direction they are oriented in.
- Bonded spacer: a metal spacer that has elastomeric material wrapped around the metal component, offering additional isolation. These typically feature a cylindrical geometry.
- LM damper (also referred to as “gum” or “gel” spacers): a unique type of spacer that utilizes a specialized silicone/gel damping fluid that is then coated with elastomer. These offer additional isolation, which is most noticeable during aircraft startup and shutdown, adding damping targeted at high-deflection dynamic deflections.

Engine mount installation

The kit’s sandwich mounting halves and spacer are positioned around the bracket of the engine mount. Mounts that are pre-compressed will deliver the best performance. Many factors are involved in achieving proper compression of our engine mounts. We offer specialized designs tailored for each application. Through the combination of the correct bolt size, proper stiffness of the individual sandwich mount components, bracket thickness, and correct torque specifications, adequate compression for each mounting set can be achieved.

Our General Aviation Engine Mounts may be bed-mounted

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(below the engine) or rear-mounted (on the back of the engine) and can be semi-focalized (directed toward a common point) or fully focalized (also known as dynafocal). Focalized design systems have a specific position that the mounts point toward. This becomes the center of gravity for the entire system -- including the engine accessories, propeller, and any additional elements of the system.

Why do we focalize our systems? The linear motion at the focalization point controls the motion at extreme locations of concern and reduces the motion at remote locations, allowing for controlled modes and increased vibration isolation.

The natural frequency of a system is defined by the stiffness of the selected mounts, the weight of the system, and the number of mounts being used. As stiffness increases, natural frequency increases but deflections decrease. As stiffness decreases, natural frequency decreases but defections increase.

Selecting a mount that optimizes the system involves a balancing act to ensure the correct compromise between natural frequency and deflection is achieved.

When designing our specialized systems, we ask our customers questions including how many mounts they will utilize, where mounts are located and their orientation on the aircraft and the desired stiffness of the mounts to ensure the proper deflections and isolation for the system. With this information in mind, we ask ourselves questions such as: Is a certain type of spacer needed? What elastomer is required for the desired stiffness and isolation? How big and what amount of load area do the mounts need? What mount style will be used? Are there environmental concerns such as high temperatures or any fluid concerns for the system?

By asking these questions, we can design the perfect mounting system for our customers.

The perfect mounting system

However, there is no such thing as one perfect mounting system that can be used for all aircraft. Instead, creating the perfect or ideal mounting system for each aircraft requires compromises that depend on the design goals and any associated limitations. Depending on the design, certain components can be optimized when building the mounting kit.

For example:

- If the goal is to reduce vibration and shock, a specialized blend of elastomer and LM Damper can be used.
- If the goal is to control engine motions, a stiff elastomer can be used to limit motion.
- If the goal is to add a fail-safe option, interlocking metal components can be used to make the system fireproof, for example.

Other factors that can be taken into consideration to optimize the mounting system are weight, simplicity, expense, and product life.

When designing the mounting kit, several factors must be considered such as the size of the elastomer: its shape and stiffness (not just static but dynamic as well), the degree of damping to achieve, how the mounts will attach, the loads and deflections that the mounts may experience during flight, and the fatigue they are predicted to experience from those loading conditions.

The last step and some may argue the most important, to designing the mounting kit is choosing the type of elastomer for the application.

We are known for our specialized elastomers. We can target and control different areas to achieve the correct mount performance using elastomeric materials tailored for specific stiffness or damping needs. When designing our system, we consider all loading directions and modes. The primary loading modes are shear, compression (where the mounts are being pushed), and tension (when they are pulled).

As a result, we achieve different performance characteristics from our elastomers within these various modes.

To learn more about our engine mounts and zero-maintenance shimmy dampers, check out our webinar or give us a call at 1-877-ASK-LORD.

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