

Subject: [c-a] Front landing gear bouncing

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[The Canard Aviators's Mailing list]

When all those e-mails started flying back and forth about problems with the front g strut and spring, I was up to my ears and could not take part.

The reason you have shock absorbers on your car is not to "absorb shock" as the name suggests but to dampen the tendency of the springs to store the energy and immediate return it back into the system. Any spring that is in a compressed state wants to re to a relaxed state and, unless restricted, will try to do just that. However, the en is once again reflected back into the spring and the cycle is repeated. Friction or Hystereises (never could spell that!) might dissipate some of that energy and if lef alone the system will calm down. If the plane is moving however, it will continually "pump" more energy into the medium.

The hydraulic devices you call shock absorbers restrict that tendency by forcing a v liquid through an orifice. It doesn't inhibit the length of travel but it will, if properly configured, dampen oscillations.

There is no such device on the front fork of a Long or Ez and those of you who thoug solved the problem by going to a softer spring have not really solved anything. All have done is reduced the storage available for that energy, softened the ride some a increased the likelihood of hard internal parts colliding and breaking.

There are at least two ways to address this with dampeners: one with a small oil fil cylinder, similar in both appearance and function to hydraulic dampeners on your car flat steel insert similar to those used with valve springs on high performance camsh

A wound, flat sheet insert looks just like a coiled spring except A: it's made from sheet steel, not round and B; is usually countrawound to the direction of the main s Of more relevance however is C; It's a tight friction fit inside the primary coil sp The friction between the two coils dampens the tendency for the spring to store ener

There's more that influences all this and the sad part is that what follows is almos impossible to deal with in a plane as light as a Long or Ez.

The ability of anything rolling along a surface, to follow that surface is determine ratio of weights. The ratio of the "Sprung Weight" (n this case everything above the fiberglass strut) to the weight of the front suspension system (hich includes the fo tire, rim and most of the strut itself)

The reason big heavy cars ride so comfortably is that the ratio of that big heavy bo all it's machinery is immense when compared to the weight of the tires, rims, brakes suspension, not because the springs are soft. As a consequence, the shear mass of th sprung weight resists the energy shoved into by the wheel and such, when they hit a Smaller cars, by comparison, don't have the shear body mass and as a consequence, th ratio of sprung to unsprung weight is relatively small. Hit the same pothole with a that you hit with a Cadillac and the resulting loss of ride comfort and stability is immediately apparent.

Translate this phenomenon and thinking to an airplane that has a severe rearward wei bias, relatively low weight up front and a needlessly heavy casting and parts and yo readily see that ride comfort is not in your future. The ratio of the two masses are close and the plane will respond, it will be displaced eventually. The softness or

hardness of the spring only affects the duration over which the displacement takes place, the total amount of energy is the same.

You could improve ride quality by adding a few hundred pounds of ballast to the front but you don't need to have a four digit IQ to see how dumb that is!

Airplanes are a lot like submarines: they are optimized for a particular medium and nowhere else. Subs are designed to be underneath the water, not on top. Airplanes designed to fly and the typical designer will compromise landing gear and related components in a heartbeat if he can make the plane go faster.

Ettore Bugatti said it best. When criticized for the bad brakes on his otherwise excellent cars, he was quoted as saying:

"I build my cars to go! Not to stop!".

Aircraft designers aren't much different. They build their planes to fly, not to taxi.

Unless one of us comes up with an oil or air dampened shock, you'll simply have to live with it. Don't complain: I remember the original design. There was no spring at all!

Art Bianconi