Vibration Isolation

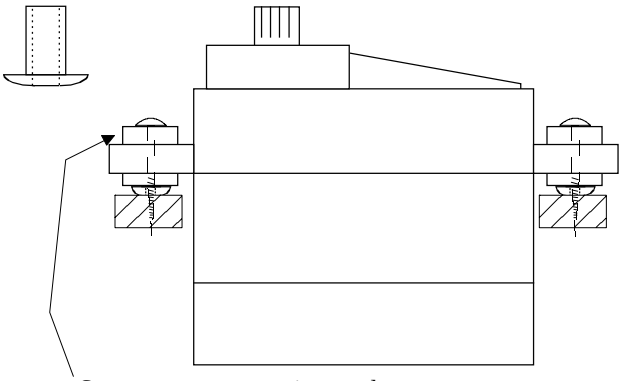
By Lloyd Sullivan

Vibration isolation is a very important aspect of our hobby. Vibration is always trying it's best to take your model back apart by loosening every screw, bolt, and set screw in the whole machine. It is also trying hard to remove your covering, unglue your hinges, and destroy each and every component of the radio not to mention doing a great job of causing any slop to become greater and turning slight control system operating clearances into slop. Although the radios we use today are far more tolerant than they were a few years ago, we still need to respect vibration as the destructive force it is. The source of this force is, of coarse, the engine. I think I just had a Dr. Seuss moment. Single cylinder engines are counterbalanced for the rpm they will most likely run at most of the time. At best, they can only be counterbalanced to achieve the least amount of vibration. The only time your airplane or helicopter can be vibration free is when it is not running! Our job as builders/pilots is to isolate the vibration to minimize the effect.

Every component of the radio with the possible exception of the switch should be properly isolated from vibration with foam rubber or in the case of servos, rubber grommets. Components isolated with foam rubber should be securely wrapped so as not to let any part of the component come in direct contact with the vibrating airframe. Foam should not be compressed more than about 25% of its thickness for maximum benefit. I have seen receivers and batteries wrapped in foam and then taped so tightly that the foam is compressed to nearly nothing. This compression removes the foams ability to absorb the vibration. Other installations I have seen have the receiver and/or battery wedged into a tight spot compressing the foam to nearly nothing, again, eliminating the isolation. Do Not use friction (by wedging them tightly) to secure your receivers or battery packs. You are inviting a failure when you do.

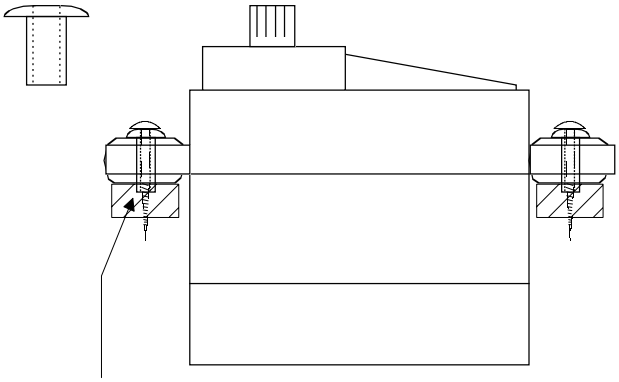
Servos installed either without the eyelets through the grommets and screws tightened so tight they completely compress the rubber grommet, or the eyelet in upside down (flared part on top) are also common mistakes made by many. The eyelets are designed to be slightly shorter than the thickness of the servo grommet. When the screw is snugged against the eyelet it will compress the grommet only slightly thus allowing the rubber grommet to provide maximum vibration isolation. If the eyelet is in the grommet with the flared end on top, the straight end will sink into the servo rail allowing the grommet to be over compressed and preventing isolation. See figure 1 below.

Correct eyelet installation



Snug servo screw against eyelet ensures proper grommet compression and vibration isolation.

Incorrect eyelet installation



Over-tightning causes eyelet to dig into servo rail and overcompress the rubber grommet which reduces or eliminates vibration isolation.

Figure 1

Foam rubber selection is also a topic for consideration. As foam density increases, its ability to dampen vibration is reduced. The best choice for vibration isolation is foam rubber, not rubber foam. I know this sounds a little weird but there is a difference. Rubber foam is what your stereo equipment and other stuff are packed in. You can also get a mattress made of rubber foam. Although this will work to some extent, it is not the best choice for vibration isolation. I buy foam rubber at the hobby shop in packages about a foot square. It is white and has one slick side and one rough side. It is real rubber, not a man made poly-whatever material. Foam rubber is definitely the better choice for vibration isolation.

Switches require the least amount of vibration isolation because they are usually potted inside the switch cover. This means that they are filled with silicone or some kind of resin to capture the wire connections. High frequency vibration will vibrate the wires at the connection point and cause a solder joint failure if the switch is not potted. Remember this if you decide to build your own switch harness. NEVER use single conductor wire in our hobby (except for landing gear and pushrods). Use only stranded wire. The more strands there are and the more flexible it is, the better the wire is for us. Single conductor wire or wire with only 5 or 6 strands will not hold up to the vibration. High frequency vibration is also the reason you should never use toggle switches for radio switches. Toggle switches depend on spring pressure to maintain closure. Cheaper switches even when they are new and good switches after they get older allow the vibration to cause the switch contacts to bounce open and close effectively turning your radio on and off several hundred times a minute. This is hard on the radio equipment. Toggle switches do not usually last long in our high frequency vibration environment. I know there are heavy-duty toggle switches out there and you will get by for a while, but as the saying goes, "You may win a battle or two, but you won't win the war." Do yourself (and your equipment) a favor; use switches that are designed for our hobby.

There are many things in our hobby that seem to be working against our success. They are vibration, dirt, gravity, fate, lack of funds, inexperience, etc., etc., just to name a few. The better understanding we have of each, the more likely we are to succeed. The only way I know of to eliminate vibration to the radio gear is to either not start the engine or start flying gliders. The more you do to reduce the vibration that gets to your radio equipment, the longer it will last and the better it will perform.

I know there are soft mounts for the engine but I have no experience with them. Pilots I know who have tried them have mixed reviews. Some say they are great, some say they rob power, some say they can't tell any difference. I don't know. If anyone has experience with soft mounts, preferably more than one, it would make a great article for later. That's it for now.

*** See you at the field ***