

Ball bearings – are they necessary?

We would like to think that we offer the best wheels available for giant scale radio control airplanes. We also recognize the necessity for us to be aware of what is available in the market place and meet the expectations of our customers. For these reasons we are announcing the availability of ball bearings in our main gear wheels, explicitly the 4 ¾“ diameter wheels with our new soft treaded tires. We also want to point out some of the mechanical realities of anyone’s ball bearing equipped wheel spinning on anyone’s axle.

Everyone might like to drive a Ferrari or a Peterbilt but most times the requirements of the job to be done outweigh our fondest fantasies. Let’s look at the typical 20 to 40 pound giant scale airplane. Obviously, the very fact that it is light weight by design means that its minimal weight distributed over 3 wheels is not a big problem to support. Most folks fly five to ten flights a week during their “season” depending on the weather in their local. If each flight is a 10 minute time segment then maybe 20 seconds of that is spent rotating the wheels under this minimal load.

Depending on the relationship of the main gear location to the aircraft’s CG there is usually 20 or so percent of the planes weight on the single small diameter tail wheel while the other 80 percent is shared by two 4 plus inch diameter main gear wheels. There is a message here. RPM is very interesting when it comes to our giant scale airplanes. If you run the numbers you will find that your tail wheel is spinning at 4500 plus rpm if your maximum take off speed or landing speed is 30 mph or more. The main gear wheels are about a third of that. However, you have to keep in mind that this situation takes place 10 times a week, during season, for a few seconds of each take off and landing.

There are other factors, the biggest one being the rotation of all the wheels and the vibration they are subjected to, while the plane is in the air. Also, the wheels are shouldering an osculating load while in the back of your car or trailer but hopefully not rotating.

In our opinion these are not conditions that call for ball bearings, and if they did, they belong in the tail wheel.

Let’s look at what ball bearings offer and what their short comings are:

1. They do a great job with high rotational loads and provide very concentric running. We do not have high rotational loads and while concentricity is nice our spongy tires run out so badly that a few thousandths in hub run out becomes academic.

2. Ball bearings are subject to corrosion and rust which can be a problem for us, especially those of you who fly off grass fields in wetter climates. This means sealed ball bearings should be used in our applications. Please note the word “sealed” this is not the same as shielded which is what most miniature ball bearings are. You can get ½” shielded ball bearings from several suppliers on the internet for \$.60 each. A like “sealed” ball bearing will cost you \$4.00 each in lots of 100.

3. Common sense tells us that for a ball bearing to provide the advantages it has to offer over a simple bushing the inner race has to remain still in relation to the outer race. This forces the balls to rotate which is what it's all about. This is easier to describe than to achieve, particularly where model airplane wheels and axles are concerned. Forcing the outer race to rotate with the wheel can be done by pressing it into the wheel hub. The problem is keeping the inner race firmly attached to the axle. Without going into a long involved discussion about press fits and the commercial availability of model airplane axles that would be a convenient press fit onto readily available ball bearings let's just assume that pressing our wheels onto our axles is not a practical expectation. This also assumes that you have something to do the pressing and the tooling to put the pressure on the inner race while somehow supporting the back side.

You are probably asking "who cares" let her spin. There is some inherent resistance in all ball bearings. In most cases the bearings internal resistance will be more than the simple sliding resistance of the hardened inner race of the bearing against the hardened axle (usually music wire) that most of us are using. We now have a situation where we are carrying the extra weight and cost of a ball bearing wheel and using the inner race as a bushing on the axle. If you look at the oil accumulation on the bottom of your airplane you will see where the lubrication comes from.

I have seen some efforts to overcome this situation by squeezing the inner races between two nylon washers to try to fix this inevitable problem but nylon by nature will extrude and deform so this will not last more than a few flights before it releases whatever preload it was providing and the inner races will be free to spin on the axles.

We are offering ball bearings on our 4 3/4" wheels but not recommending them unless you fly a couple hundred flights a year and even at that you can replace the bushings we provide in our wheels several times before it would justify the extra cost of the ball bearings. We are also concerned about corrosion and rust. Our ball bearings have an extended inner race which means the inner race is wider than the outer race. This is very important because you do not want the shoulder or the wheel collars to rub against the outer race or the seal. The only practical way to prevent this is with the extended inner races. Because of the hostile environment these bearings will be operating in we cannot guarantee their performance or reliability.

Please call for additional information