# A Helping Hand WITH HEIMS

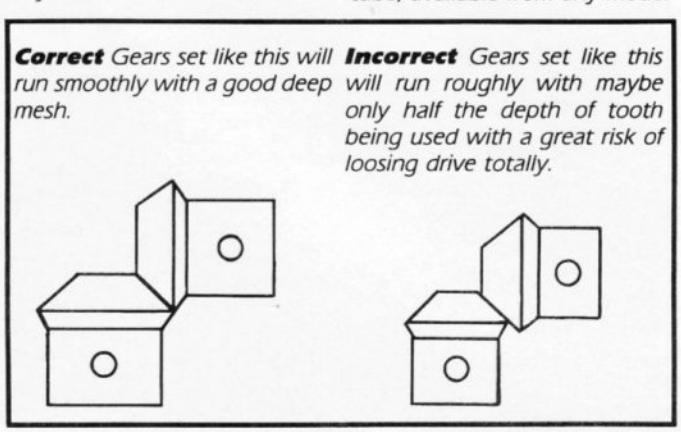
## Jim Fox starts a series on the popular Heim Mechanics

I get a lot of telephone calls in the shop regarding the building of Heim mechanics and the problems that can occur. During a conversation with Martin Briggs we came to the conclusion that a series of articles on the subject of building Heim helicopters, highlighting some problem areas and how to get over them by careful assembly and the odd modification thrown in for good measure, would be a useful idea.

Now, I'm not trying to say that the following methods are the only way to do things but by my own experiences and by just talking to other Heim owners, I think I've formed a pretty good picture of what is likely to fail and what isn't, and over the years I seem to have got my own Heims running reliably. (I'm going to wish I hadn't said that!)

This first article is on the tail rotor gearbox. This is the part of a Heim that seems to be the most difficult to get right because you cannot see the gears and most people just assemble it as it comes and hope that it's all right. The way I find out whether or not a gearbox is correctly assembled is to cut a hole in the top of a casing and then to use this casing as a jig to correctly mesh the gears, afterwards removing the shafts, gears, etc and assembling them in an untouched gearbox. This sounds a bit drastic but when you consider the cost of a model and the cost of a gearbox failure than it seems fairly cheap. A few years ago I wrecked an Avante Garde, a pair of fibreglass blades and bent various shafts on the mechanics due to a tail rotor gearbox failure. And, of course, this method gives you a jig for use on all your tail gearboxes in the future.

The major problem with assembly is the meshing of the gears. The teeth are tapered so they must run corner to corner.

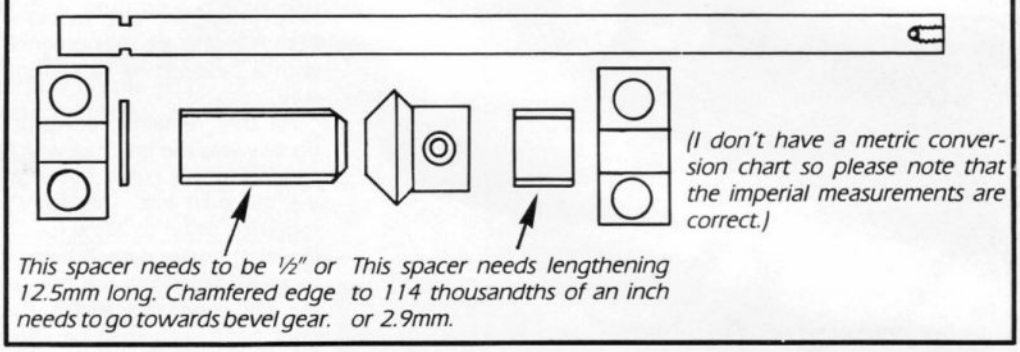


***Correct*** *Gears set like this will run smoothly with a good deep mesh.*

***Incorrect*** *Gears set like this will run roughly with maybe only half the depth of tooth being used with a great risk of loosing drive totally.*

The reason for the problem is the brass spacers on the output shaft.

The standard short spacer averages about 102 thousandths of an inch whereas the ones I use in my gearboxes are 114 thousandths of an inch. These figures look a bit daunting written like this but what it means is that the standard spacer is about 1/10 of an inch and the modified one is thicker by about the thickness of thin card, so for those of you out there without any measuring equipment — the best of luck! The modified spacers are made from brass tube, available from any model shop — just take your shaft into the shop and find a piece that fits. The large brass spacer, if used, would have to be shortened by a corresponding amount. This spacer is mainly used for setting the gear position, and can be removed.



*This spacer needs to be ½" or 12.5mm long. Chamfered edge needs to go towards bevel gear.*

*This spacer needs lengthening to 114 thousandths of an inch or 2.9mm.*

*(I don't have a metric conversion chart so please note that the imperial measurements are correct.)*

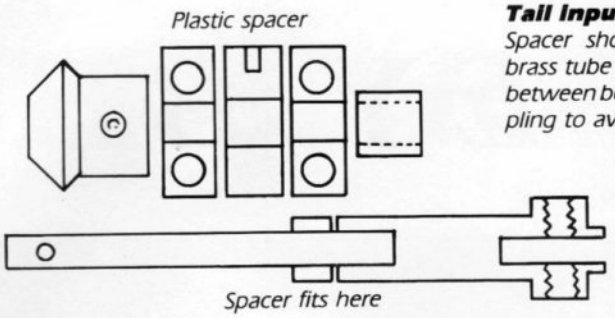
Gently tighten the two 3mm grub screws in the bevel gear to hold it in place. The shaft with gear spacer and bearings should then be slid into the gear case and checked for end float. There should be no in-and-out movement of this shaft once the 2mm screw in the side of the case is fitted. The input shaft can now be slid into the gearbox, gently easing this down until a mesh with the other gear is achieved. This should have a very small amount of backlash, making sure that there are no tight spots.

A new hole will have to be drilled in the plastic spacer to locate the input shaft. When you are satisfied that the whole thing turns smoothly and there is minimal backlash you pull it all apart and remove one grub screw in the bevel gear on the output shaft. Drill down the hole until you make a slight dimple in the shaft then replace the grub screw (after cleaning the swarf out of the hole). Do the other side. Now that you have two marks on the shaft, clean the threads in the gear and assemble, putting some Loctite on the grub screws. Loctite should be used on the input shaft grub screws also. Make sure when replacing the gear on the shaft that it goes back on the same way as it came off because the holes are not always opposite each other.

As can be seen from the diagram above right a spacer needs making to avoid end float in the input shaft. The two grub screws go into two dimples in the shaft. The inner bearings on both shafts should have their seals removed and the inner seal on the outer bearing should also have its seal removed. This allows grease to get to them. All bearings should be packed with grease during assembly.

When thoroughly satisfied with that lot, you can turn your attention to the hub and tail blade holders. You'll be pleased to hear that this is very straightforward and as long as the parts are in the correct order then there will be no problems.

The pitch slider should have the aluminium hub and bearings slid onto it followed by the plastic pitch plate. A fillet of glue should be used to hold the pitch plate to the brass sleeve. I have successfully used both 24-hour Araldite and superglue. If you use superglue use the thick variety and don't let it run into the bearings. A steel ball is then fastened to the alloy hub with a 2mm screw; again a little Loctite on the threads will stop things working loose. The pitch bellcrank revolves around a brass sleeve and is held to the case by a 2mm screw. Two plastic ball links connect the blade holders to the pitch plate. The length of these control the tail pitch and nearly always need shortening by about 1/8in. When




***Tail input shaft***

*Spacer should be made from brass tube and needs to just fit between bearing and brass coupling to avoid end float.*

in use the tail blade holder should run with the links on the leading edge. The alloy hub rocks on a rubber teeter tube. The easiest way to fit this is to get some large bore fuel tube about 3in. long, slide this on the output shaft and slide the hub down the tube stretching it a little.

You should now have a tail gearbox that is smooth, with no tight spots. If you are satisfied then remove one of the shafts and half fill the gearbox with a good quality grease.

You should next file a flat on one side of the tail drive wire and tighten the grub screw to the flat side first, making sure that the grub screw used has a flat base to it.

**Do's**

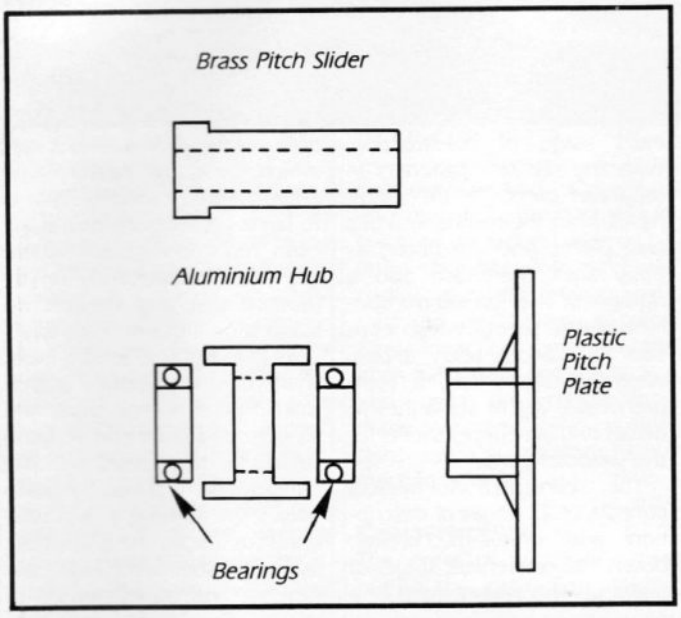
1. Do use Loctite on the grub screws.
2. Balance the hub with the blades attached.

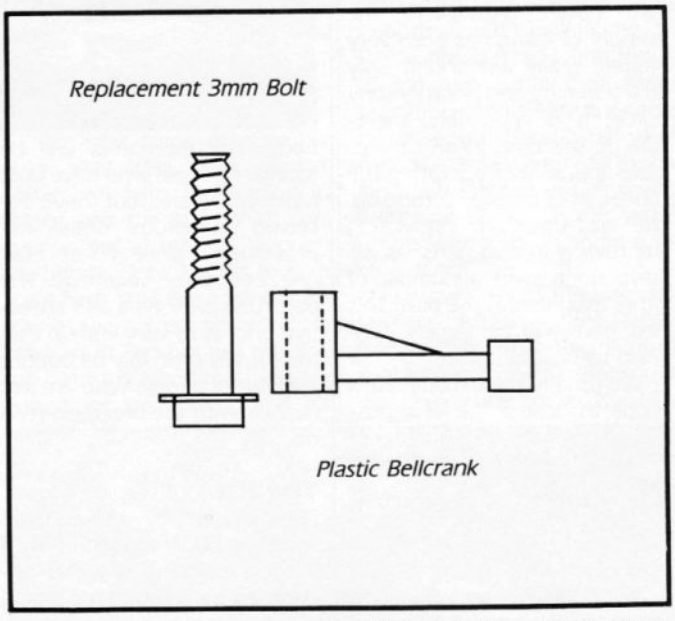
**Don'ts**

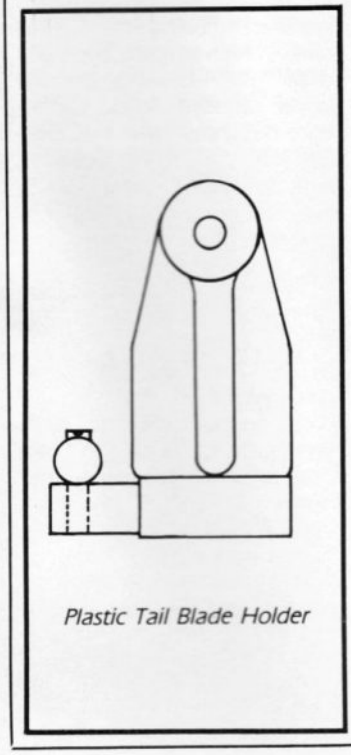
1. Don't use copper brake pad grease as lubricant.
2. Don't have any end float in either of the shafts.
3. Don't fly with bent shafts.

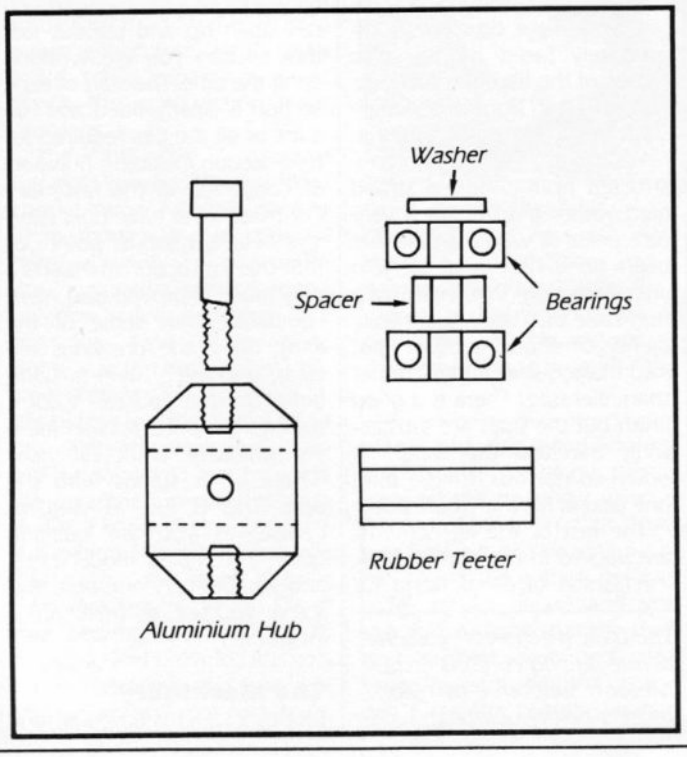
**Modifications**

1. It has been known for quite a few of the 2mm bolts that hold the pitch bellcrank on, to snap off, so I always replace mine with a 3mm bolt and discard the brass bush. The hole in the case needs tapping out to 3mm and a bolt with a small shank fitting.




Ballraced bellcranks are available. They also use a 3mm bolt.

2. If any of you have had the drive wire slip in the brass coupling you will be pleased to know that there is a 4-grub screw input shaft now available.
3. Thrust races are the 'in thing' nowadays and these are available for the tail blade holders. Whether the model flies any better for having these is debatable but having them will mean less friction which in turn ought to mean smoother control, and for those who want the best they feature prominently on the shopping list.

I hope this article has been of some help. My next article will be on the clutch, main gearbox and side frames. If anyone out there is totally baffled by my style of explanation then please give me a ring in the shop on 0482 861795 (in shop hours please) and I will try and help over the phone.□