

About the Hirobo Tsurugi

The Reason for Choosing a Tsurugi

The Hirobo Tsurugi captured my attention while searching for a new model helicopter. I had been flying a GMP Competitor several years earlier which finally succumbed to an interference problem at Thunderbird field. I knew that I wanted a 60 sized machine since that was the engine that was available to me, plus, the larger helicopter would be more stable and easier to see than if I tried to learn again on a 30 size heli.

I looked through all the modelling magazines checking the prices and features for all the 60 size machines available. Two years ago the choices were:

1. Miniature Aircraft's X-Cell (standard, custom, custom graphite, and pro)
2. Kyosho Concept 60
3. Robbe/Pica Futura
4. Hirobo Tsurugi (plus its more expensive brethren, the Eagle)

As I mentioned earlier, I am not one to follow the crowd, and the crowd were flying the X-Cell. It is certainly a fine flying helicopter, but is much more complicated than the Tsurugi (as you will see later). The Kyosho Concept 60 seemed like a fine machine, but I had never actually seen one fly and the 30 size Concept didn't seem to be that well made with its plastic balls and unpaintable canopy. The Robbe/Pica (and Schluter) machines seemed about right, but they were more expensive.

The biggest plus that I had with the Hirobo machine was that I had previously flown a GMP "Competitor" and thought that perhaps some of the hardware could be used as spares for a newer heli: and in case you are wondering, apart from some screws you can not.

After exchanging a hefty wad of greenbacks (what a lie, it was a check) for a Tsurugi, it was on to the kitchen table. Most of Christmas day '95 was spent building the model and here I realized one of the best features of the Hirobo Tsurugi: it is entirely possible to build the model in 14 hours. This does not include painting the canopy which took me a couple of days during the first week of '96 to complete.

Building the Tsurugi

Provided Assemblies

Many components on the model are completely assembled for you. The rotor head is assembled ready for installation of the flybar and paddles. The tail rotor gearbox is completely assembled too and ready to slide onto the end of the tailboom. If you were building an X-Cell those two assemblies alone would take on the order of 4 hours.

Composite Head

The rotor head is a huge composite structure mounted on an all aluminium mast block. The rubber dampers are relatively soft, but this is absolutely no indication of the crisp handling possible. My experience has shown that the damping rubbers play only a small part in the handling qualities of a model.



On an engineering note, the blade holders are attached to short stub axles that are molded into the yoke. They are virtually impossible to bend even after a really hard crash. Each of these axles provides 0.5° of positive coning angle. Funny, but the Tsurugi appears to be just as stable upside down as it is right side up. True!



I have heard it said that the composite heads are smoother flying than the metal heads. Several people I know who converted their X-Cells to the metal head (yoke and blade holders) have said that they flew smoother with the composite heads. The composite material is a better absorber and damper of vibration making you look really good while hovering in front of your friends.

Back at the Tail



The tail rotor gearbox slides onto the boom, and voilà, your tail is just about complete except for the vertical/horizontal fins and tail blades. There is no backlash adjustment necessary, no packing the gearbox with grease, no rubber dampers to install, no time or hassle needed.

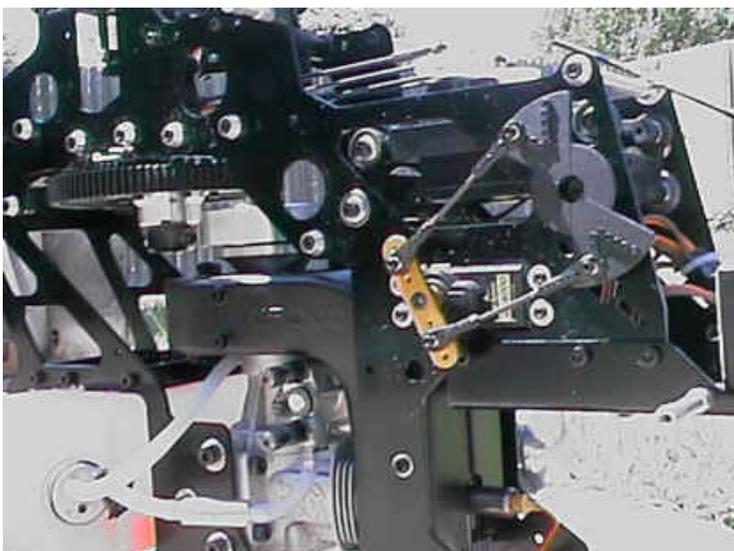
Incidentally, the tail rotor servo is mounted aft of the frame on the tailboom. Its control rod is as short as feasibly possible and direct. The whole assembly is solidly engineered with smooth, friction free drive to the tail rotor's pitch change mechanism. Usually, an aft mounted tail rotor servo costs money in the form of an upgrade.

The tail rotor gearbox receives its input from a beautiful stainless steel tube drive system (on the XX Tsurugi). At each end of the tube is a well made male and female dog bone assembly. The male part is made from aluminium and the female from a white nylon material. It is totally slop free and of course will generate no electrical noise. The torque tube is supported by two ball bearings each of which is surrounded by a rubber sleeve. The whole assembly is easily inserted into the tail boom and the rubber sleeves allow a firm, vibration absorbing fit.

The stainless steel shaft does not appear to be prone to shattering like the graphite drive shafts. Again, Hirobo appear to have engineered out problems that other manufacturers have had.

Frame

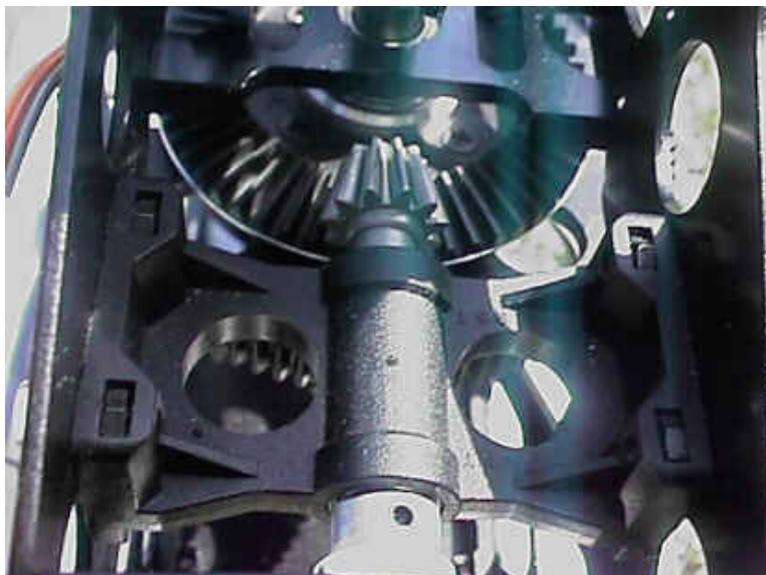
The frames are flat and bolted together with spacers, engine mount, gyro platform, and bearing blocks. Ensuring that their square could not be easier as everything is straight and symmetrical. The one impression you have when assembling the frame is that the model is large. Placed beside other 60 size machines it appears to be a "head" taller (excuse the pun) with a much wider body. This provides for easy maintenance, cleaning is simple because you have a lot of room between the frames to get a cleaning cloth. Inspections are similarly easy, and with all that room linkages are short and direct.



Picture illustrates the collective mechanism. The large butterfly swings the servo tray fore and aft in an extremely rigid, slop free assembly.

Gear Mesh

It could not be simpler, just bolt the clutch to your engine and run the start shaft through the bearing. The main shaft drops through the main bearings and the main gear is subsequently secured to the shaft. There is no messing around with run out or placing strips of tissue between the gears to adjust the mesh. There is no uncertainty about whether the shafts are parallel to each other or if the tail drive take-off bevel gear will strip the main gear (sorry, but put a piezo gyro in your X-Cell and watch it eat the main gear).



Linkages

Speaking of short and direct linkages, the Tsurugi was the first model helicopter I had seen where it was possible to lose one link on every control rod from servo to swash plate without having any control problems. This is because the entire setup is push-pull with mechanically accurate geometries (try that with an X-Cell). There are no bends on any control rod and if you have the XX version of the Tsurugi all control arms ride on double ball bearings. Only the Bergen Intrepid offers similar built-in redundancy to the control system.

Servo Mounting

The cyclic servos are mounted on a tray which is part of a swinging parallelogram. They are rocked by the collective servo which is mounted to the right side frame. The throttle servo is similarly mounted directly opposite on the left side frame. All the geometries are straight forward so there are no worries about mounting your ball links at some offset on the servo wheel.

There is ample room on the forward cabin tray to mount your radio equipment and battery. My Tsurugi balances perfectly with a 5 cell 1400mAh pack with no ballast necessary.

In Closing...

I would be more than willing to discuss with any heli pilot the merits of the Hirobo range of model helicopters, including building, flying, setup, maintenance, or any religious experience felt while flying.

Flying the Tsurugi

Setup

If you follow the construction manual, you will setup the machine for more hovering or FAI type manoeuvres. That is, the linkages are adjusted so that mixing and washout arms are level at around 5.5 degrees. This is a great place to begin if 3D is not your style of flying. Simply follow the directions in the manual (and use the cool cardboard template provided to set your pitch), and program your radio. Incidentally, I will have more detailed mechanical and radio programming techniques added to the site by the end of the month.

For a 3D setup, adjust the lengths of all control rods so that the swashplate is center in its vertical travel. At this point, the blade holders should be at 0 degrees with flybar level. Bell-Hiller mixing arms should be level as should the washout mixing arms. With this setup, you can easily attain 9.5 degrees of pitch both positive and negative.

The tail rotor should be set for about 6 degrees of pitch with the servo centred (use sub trims to centre the servo if you find that one spline either way on the control arm is too coarse).

Hovering

You will find that the Tsurugi loves to hover! It is absolutely the Cadillac of hovering machines, and can do so with a head speed of 1100 rpm to 1800rpm. If you are at the novice to intermediate level and are using 680mm blades, I recommend a head speed of 1600rpm. This gives a pleasing balance of power and stability without getting overly sensitive to collective or cyclic changes.

The supplied tail rotor blades are perfect in length although I would like to replace the plastic with a stiffer material. Actually, Hirobo make excellent wooden tail rotor blades which are much stiffer and a more rounded leading edge. Aerodynamically speaking, I am sure that the wooden blades would be more resistant to stalling than the stock, sharp edged plastic blades.

Add plenty of exponential to your radio, I use 30% and one of my friends uses over 40% expo. to soften the response. The Tsurugi will hover hands off for extended periods of time which makes it a first class trainer or FAI contest machine.

Circuits

You will find that the Tsurugi loves to fly circuits. It flies with the speed and precision of an arrow to a target. Its large physical size is easier to orient than smaller machines, and the stability it provides in the hover translates to the tightness of a pattern ship in forward flight. The tail is powerful at any forward speed, and the cyclic response nimble and fast (with weights removed), or groovy and forgiving with the weights installed.

The Tsurugi flies well at high speeds which provides the energy for really large loops. It seems unaffected by gusty or high wind conditions; you can be flying when the fixed wing fliers have gone home. Rolls look beautiful as rolls always do with lots of forward speed. Friends of mine are doing 4 and 8 point rolls with their Tsurugi and that is without the benefit of the new CSM gyro.

I am powering my Tsurugi with a YS 61ST engine, only because the rear bearing failed in my OS 61SX. I cannot see any difference in power between them. They both hover well, and both have their share of mechanical problems, i.e., the rear bearing in the SX (fixed in the WC version), and leaking carburettor in the ST. You just take your pick and pay your money.