

# Hirobo Shuttle

## Hirobo's Mk II Shuttle Reviewed.

When the Shuttle first appeared, it represented something of a revolution in model helicopter kits, being not only almost ready to fly, but also offering a capability to perform aerobatics, right through to autorotations, "straight from the box". Very little in life is perfect and looking back over the review of the original Shuttle that I did for R/C Model World, the Shuttle had its faults, though of minor nature. Extensive use "in the field" by many thousands of customers, world wide, showed up the two most serious criticisms to be, the ease with which inexperienced could smack the blades down into the tail boom from a hard landing and some indications that the main frames could be a little more substantial. That Hirobo have listened to their customers and no doubt, have an ongoing development program, is indicated by the introduction of an updated machine in two versions, one being a direct replacement and the other being a more up-market model having extensively ball-raced linkages, boom steadies, a metal undercarriage and an OS 32 for power.

Needless to say, I was very

keen to take a look at the new standard version and am indebted to genial Dave Niman for the chance to do the job properly by building one up from a brand new kit.

Let's say right now that I was surprised at the extent of the changes made; some are major and obvious, but there are also a whole lot of more minor ones, all amounting to a really serious upgrade program, not just a "face lift". Since there must be people out there who haven't seen a Shuttle, I will review the model from scratch — it deserves it anyway — and indicate the mods as they crop up.

### The Kit

The machine comes packed in a

large expanded polystyrene 'Coffin' which opens to reveal the completed model less pre-assembled head, blades and undercarriage, with OS 28 FSRH ready installed. Plastic bags contain the instruction manual, attractive decal set, offering a choice of decor, tools and various parts required to complete the assembly. Included in the tool kit is a plug spanner, screwdriver and allen keys.

Push rods to the head were ready fitted on the old version, but owing to the increased height of the mast on the new one, the head and rods are packed separately. These and the small number of screws and nuts required to complete the model are packed in separate bags, each one dedicated to a particular stage of assembly.

### The Model

Dragging it all out of the box gives the first impression that you have a sixty-size machine on your hands that has been left out in the rain to shrink.

The layout is very like the big brother Hirobos, but makes extensive use of plastics and uses a toothed belt tail drive in common with some of their larger machines.

The Shuttle is, in fact, a straightforward, A-frame, pod and boom model in layout. The motor sits with crankshaft vertical and head pointing forward. The main reduction gear is of the small metal gear and large plastic gear arrangement with an autorotation freewheel built into the main gear hub. The motor shaft carries the starting pulley, clutch and cooling fan. The clutch itself is a plastic,



*Bored with pod and boom? This is, in fact, a mark I machine in the delightful Jet Ranger body, available from Dave Nieman models.*



*Those decals make for a very attractive finished machine.*

two-shoe type with sliding, rather than swinging, shoes and a continuous-spring ('O-ring') tensioner. The top of this assembly is supported by a ball-race and above this, carried on an extension to the primary gear shaft, is a small toothed pulley. This pulley drives a long toothed belt which runs the length of the aluminium tail boom to drive the tail rotor. The belt is turned 90° en-route to

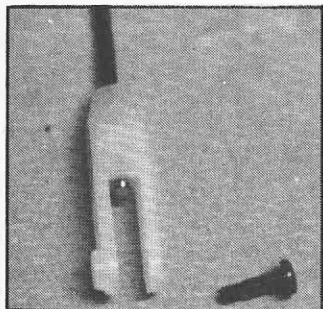


*The new head and flybar assembly is very much along the lines of the bigger Hirobos and works very nicely, cranked levers ensure you can slow this one without removing the palm of your hand!*

convert to a horizontal drive and passes under a plain idler before going round a larger toothed pulley on the tail rotor shaft itself. By this means, tail drive and speed reduction are combined with nary a gear in sight. The tail rotor shaft itself is supported between two ball-races.

Returning to the main shaft, this is supported by two ball races which are retained by moulded-in sockets in the side frames which are moulded from fibre reinforced plastic. Between these frames are mounted the cooling shroud and gyro tray. Extending forward from the frames is a tray to support the tank and radio with the servo mounts above the tank position, the whole being braced by a semi-bulthead screwed to the front of the servo mounts. To hold all this together, extensive use is made of cross-head screws with some bolts all the way across at the bearing and tail boom mounting points — a de-

*Push-rods each use a shouldered screw — where can I buy more!*



cent cross-head screw driver is a must for this model. The motor is fitted into this assembly on a solid aluminium adapter block and may be removed downward by removing 4 screws. The undercarriage, consisting of moulded legs and aluminium tube skids is screwed to flanges moulded fittings for an aerial guide tube which is already fitted.

The canopy is moulded in three parts — two sides and smoked-plastic screen. The ready finished assembly simply slides onto the radio tray and is retained by a quick-release catch between the main frames. Tail fins are moulded from the same material as the cabin, in the same light green. Summing-up, then the chassis construction of the Shuttle is broadly similar to that of the conventional bubble-and-stick, but constructed almost completely from plastic. I have heard that the side frames of the original machine were a little on the fragile side — they did look to be designed rather by taking a metal design and producing it in plastic. On the new one, considerable work has been done on the moulds to provide stiffening ribs in all the right places — particularly in the area of the rear uprights, which take a belting in the case of a hard tail down landing.

The main rotor head is like the chassis, mostly assembled from plastic moulding with metal reserved for shafts, the centre sleeve and control arms. Operationally the head is of the floating axle type, similar to that used on the Heim system. A single blade axle extends right across the head, suspended in two rubber doughnuts. The blade holders are fitted to the ends of this axle by ball-races. A well damped amount of teeter is

available by this means and the blades cannot swing down easily. Combined with the extended shaft, a large increase in boom clearance is achieved, and you shouldn't have any trouble with boom strikes on this one. The moulded blade holders are supported on two ball-races each and have metal pitch control arms. There is a certain amount of slop in this assembly at rest, most of which will be removed by centrifugal forces. In any case, the trailing pitch linkage, though slightly at variance with the basic geometry of the head, will compensate more than adequately for any flap at the holders. This lot looks like someone at Hirobo has been doing some clear thinking to come up with a sound engineering compromise — nice. The fly bar car-

screw-on links (delightful little devices these, having screw-in, plain shank, pivots) prevent the rods slopping against the blade holders under centrifugal loads.

The blades themselves are ready finished in some form of white 'paint' and are of standard Hirobo bi-convex section, but of narrower chord than the bigger models. The pair in the kit are of a good heavy weight, as before, promising good stability and plenty of inertia — unusually so for such a small model — and are very nicely made.

Tail blades are cleanly moulded plastic and are ready fitted to the blade holders which are of the single thrust-race type. These slop all over the place until the rotational loads come on, of course — but don't worry about that! The

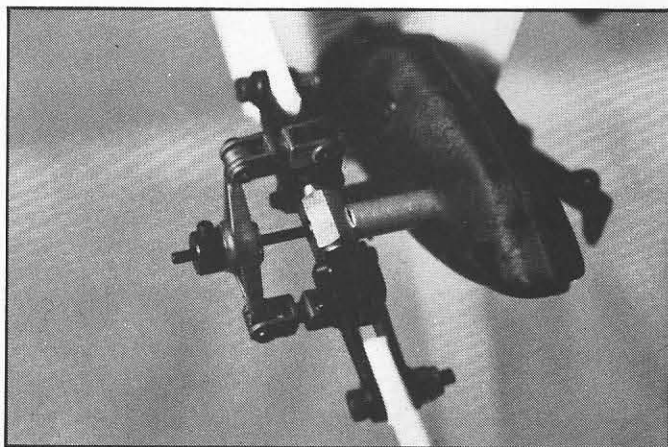


*All the bits and pieces are neatly bagged ready for assembly. Note the push-rods are pre-assembled and they even provide the elastic band for the radio!*

rier and Bell-Hiller mixing system has been redesigned from the original and is very neat; the cranked mixing arms avoid any sharp bits biting your palms, and provide smooth and precise blade angle control. The new head has allowed the push-rods to take a much tidier run up to the head and special

pitch linkage has been totally redesigned and uses some very cute little screw mounted pitch driver which employs that grey self lubricating plastic (oil it anyway — right!) that serves all over the linkages on the machine in the form of plain bearing substitutes for the miniature ball-races that the .32 powered XX version has. Dave

*Tail linkage is all new and works well. Only one grub screw is needed to retain the control unit now.*



Nieman pointed out that this linkage can be forced over-centre by careless handling and I can confirm this although it never happened to me by accident, but it is something to watch if you clobber the back end in handling. It will just pop back under hand pressure if you do do it.

### Controls

The control system is very much in the Hirobo main line. The swash-plate is a rather nice moulded plastic deal of the coaxial type. That is to say, the input and output ball joints all lie in line with the centre of the central ball about which it all rocks, thus removing any unwanted interactions caused by tilts. Collective pitch is introduced by sliding the swash-plate up and down and a scissors type of wash-out unit removes the collective signals from the fly-bar commands. Bell-Hiller mixing is employed and provision is made for the mixing ratio to be altered at the wash-out, though no mention of this is made in the instructions.

Anti-rotation of the swash-plate is taken care of by a triangulated push rod at the front, which has been beefed up for

*The revised pitch-up crank is clearly seen here. A slop-free system results which works smoothly.*

this new model. Some push rods are one-piece, moulded to length and all the head control rods come with both ends fitted and adjusted to the correct length, making for a pretty fool-proof assembly. There is small amount of slop in the total linkage to the flybar, but this is usually of less consequence in a Bell-Hiller system if the paddles are aerodynamically stable and also a little slop in the swash plate, but nothing major. The pitch up system has been modified to eliminate a bell crank and as a result is very much smoother and more accurate than before. Available throw is adequate, my model being capable of moving the blades from  $-2^\circ$  to  $+10^\circ$  — this should be enough for anyone!

### Assembly

Theoretically, all one has to do, having got everything out of the box, is add radio, undercarriage and head and fly. However, prudence (a lovely girl) suggests a more careful approach. I usually tend to the view that doesn't trust anything that I haven't actually assembled myself, but for the purposes of this review I restrained myself somewhat, simply carrying out a check over all the nuts, bolts and screws; none needed adjustment, but should they do so, remember that this is a plastic model — no gorilla tactics — please! Also, never use liquid thread locks, as many of these can destroy the plastics

used — silicone rubber may be used if necessary, but nothing was needed on the review model.

On checking over the machine, I noticed the clunk was jammed in the tank and on investigation found the pick-up line to be too long and the clunk to be rather large, suggesting that the shallow tank would not empty well, so I modified this by drilling the clunk and fitting a small brass tube extension — not a vital mod this, but I do like to fly for a long time and this means getting all the fuel out! Substitution of one of the Slec tubular types would also have worked well. The fuel line provided is now well up the job, if not transparent — you can't have everything! While you are doing this, run some silicone rubber into the gaps round the corners of the tank to prevent vibration from chafing things. While you have the silicone to hand, a possible rattling of the canopy may be eliminated by waxing the runners, squeezing silicone into the slots, sliding on the canopy and leaving over night to set. I also fitted a filter where recommended. Returning to the subject of the silicone, it's a good idea to seal the silencer, at which point I found that the aluminium silencer that replaced the very original plastic item, now has its pressure tapping at the top — nice one Hirobo.

The gyro fits on a tray in

front of the motor and this could be a tight fit for some units and it appears from the instructions that you may be expected to remove the lugs from some types. The side frames have a dedicated slot for the radio switch — provided you have a small switch — some of the older 'noble' based switches will need a bit of file work.

Receiver and battery fit on a tray at the front, complete with moulded-in retaining hooks for bands — neat stuff this. However, if you fit a 1200 mA battery here you may have CG problems. I used a set of 800 mA cells and fitted these where specified. These cells come out about  $\frac{1}{2}$  oz heavier than a standard 500 mA pack with 80% more capacity. Try electric flight specialists for supplies — mine came from Mole Technology. A 1200 mAh pack would probably best be fitted vertically against the "spine" in front of the servos using tape and a ty-wrap.

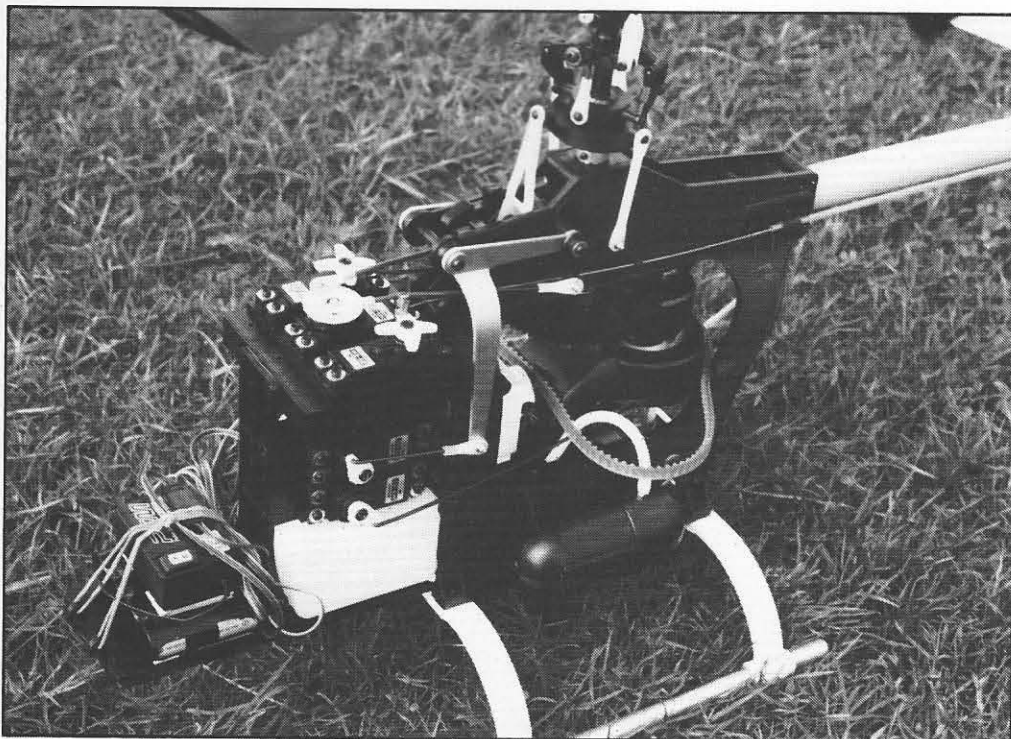
There is very little setting-up to do because of the way the servo installation is handled, in conjunction with the fixed-length pushrods. Some very minor adjustment was needed to the rods to the head, at least according to my pitch gauge. I needed two turns on one rod to match pitch between the two blades — everything else was spot on — exemplary!

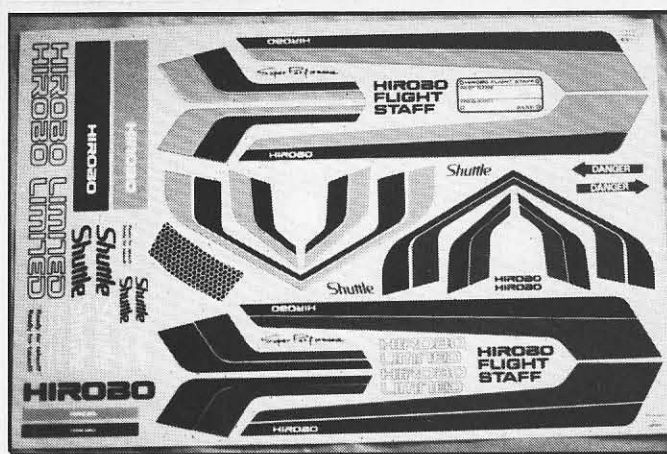
At this point I had spent about 4 hours on the model, from first opening the box and I was ready to fly — not bad (M.B. wants to know what took so long)!

A quick spin of the machinery at this point found the only snag. The bolts retaining the tail blades are too long on my model and hit the tail push rod. I'm told that they are all like this, so turn them round so the head is on the inside. You could fit shorter bolts if you have them to hand and nuts on the outside offend you!

### Flight Test

After a couple of tank fulls through the motor to settle it down, initial impressions are very favourable. The machine was in track as built! The motor was, at first, a little inclined to cough in and out of two stroking in the hover, but is settling down well — it seems a somewhat better device than was in my first one, running healthily and starting very easily indeed





These excellent self adhesive decals provide for two, separate, instant colour schemes.

On mine and I understand, some others, the top main shaft bearing is a little bit loose in the mouldings, though this has been much reduced over what could be found on some older versions. In fact, this don't hurt the running none, as they say, but if it offends the sensibilities you can add a little epoxy — carefully — or slip in a strip of mylar hinge material, to take up the slack — I didn't think it was bad enough to take the trouble and mine is running as it came. There still seems to be very little holding the skids into the undercarriage legs, both of mine coming loose and rotating on the first flight. It would be a good idea to cyano these in place, or drill them and use some tiny self tappers, as I did, to avoid this happening, before flight.

The servos retaining clamps of the original have been replaced by a more conventional method using screws and grommets, the mountings being designed to allow enlargement so most servos should be fitted OK — the JR 507s used dropping in with no adjustment needed. The instructions for setting the servo throws are very explicit and should give no problems, but could be improved slightly by quoting actual linear movements to be doubly sure. The angular movement of servos does vary from set to set, even if not by much!

On connecting the servos it becomes apparent that the bellcrank bearings are much improved from the original, as a very slop free and smooth set up results — very nice.

— I haven't needed to touch the idle setting at all. However, Dave Nieman points out that with this particular motor, the most reliably slow idle, necessary to avoid giving the clutch a hard time, is achieved by setting the idle adjustment rather leaner than normal — so much so that a finger over the exhaust may be required for a start. I haven't set mine this way yet, but I remember that my first one was similar when run in — so next time out ....

The head mixing seems excellently chosen for general flying, there being lots of control power without any twitchiness. The tail is powerful, but, again, not twitchy. A hands-off trim is easily achieved in still air and windy conditions are coped with well, especially remembering that this is a small model.

Moving out into forward flight, the Shuttle continues to impress with solid handling and smooth high speed flight — straight line stability is very good. The only things to watch for would be mal-adjustment causing the revs to decay, which will result in nodding and going too far away, when you will be reminded that it is a small model and can disappear a bit quickly! As the head damping settles in, with a bit of running, the lower limit of revs is moving down, but in any case when it is new, this "nod-boundary" will tell you if it is running too slow; at the correct speed handling is fine. In still air, the model is an absolute delight, with all three axes of control being well harmonised and solid collective control — a little posers delight in fact!

Autorotations are fine — for such a small model, amazing! I started on the third flight (yes — mad impetuous fool!) and spent the next three tanks ex-

perimenting. Again, you must remember that you have only a small rotor and you can't stretch them too far, but it really is very good, especially if you have a breeze to help. In still air, the flare and stop needs good timing as there isn't a lot to spare. Fortunately, if you do bang it on, the new head arrangement is far more forgiving. In the course of investigating this aspect of the model's performance, not all of the landings were perfect (understatement!) as I was trying to explore the envelope a bit. Suffice it to say, that even the naffest landing (you know, the wet dog having a shake type) did not result in a boom strike. In a breeze you can easily do a really smart nose-up approach and flare to a smooth touch with collective only — yes, I am impressed.

I haven't done any aerobatics, in the normal sense yet, but the model's solid controls, ability to track well at high speed and experience with the previous model suggest that it will not disappoint. Such a small model will never hope to aerobat like a big one — the weight is just not here, but nor should it disappoint the fun flyer who does his aeros just for fun.

## Conclusions

Clearly this new version of the Shuttle has been the subject of a significant program of product improvement, for which Hirobo should be justifiably proud. The Shuttle concept represents probably the most foolproof introduction into helicopter available and now has spawned a mini-family of its own within the Hirobo range. If you accept that having a correctly built and set-up model if half the battle in learning to fly — and I'm sure you do — then with the Shuttle you have most of that already done for you and the rest made very straightforward by a very good instruction manual. Perhaps the only real oddity in the manual is the omission of any reference to blade balancing. They aren't quite that good, initial vibration required the addition of about 1.5 in. of tape to one blade — confirmed by balancing the whole head on a "high-point" — to produce a sweet running machine. Taking this up with Dave produced the comment that the vast majority of blades are OK as they come, so mine

may be a bit odd. However, for that extra smoothness, good balancing can't be a bad idea.

You get a very good little flying machine for your money; a 'real' helicopter, complete with autorotation unit and engine, virtually totally assembled. Set up just as specified by the instruction manual and within absolutely no mods it will fly delightfully, including autorotating and is very comfortable in the hover. That last sentence represents high praise indeed. I'm having a lot of fun with mine. At the price, many people are likely to consider it as a back-up model and are unlikely to be disappointed with their choice. Bodies are now available to dress the model up and these obviously add some weight to the machine. While it does have a good reserve of power — especially if the 15% nitro that the manual recommends is used, the 32 powered version would represent a wise choice here, as would the bearing additions of the XX — all of which may be added as aftermarket parts anyway. On the subject of fuel, I am currently running 5° nitro synthetic oil based fuel in mine with no trouble and plenty of power.

Part of the package, of course, is the excellent back-up and after-sales service available at the end of a phone or in person from Dave Nieman's staff. The little points to note like checking over all screws, checking out the tank and so on, mentioned above are all brought to the attention of the customer when he makes his purchase. In conversation about the model, Dave also points out that the belt does not need to be too tight, it will rattle against the boom when the model is carried in a car, if it's set up right! Perhaps his best bit of advice for anyone is "Get familiar with the machine — understand it and with that understanding will come better maintenance and better flying."

A model's longevity can, by definition, only be evaluated over a reasonable period of time and I will be doing just that. For the moment, the upgrades incorporated in the new machine would seem to have attacked the majority of weak points that could show up in the original and I would not anticipate anything but a long reliable life from this one.