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FREE INSIDE!

'Getting Started Pt.1' supplement

'Shuttle Z' review

'Sky Fox' up-date

'My Star 60' preview

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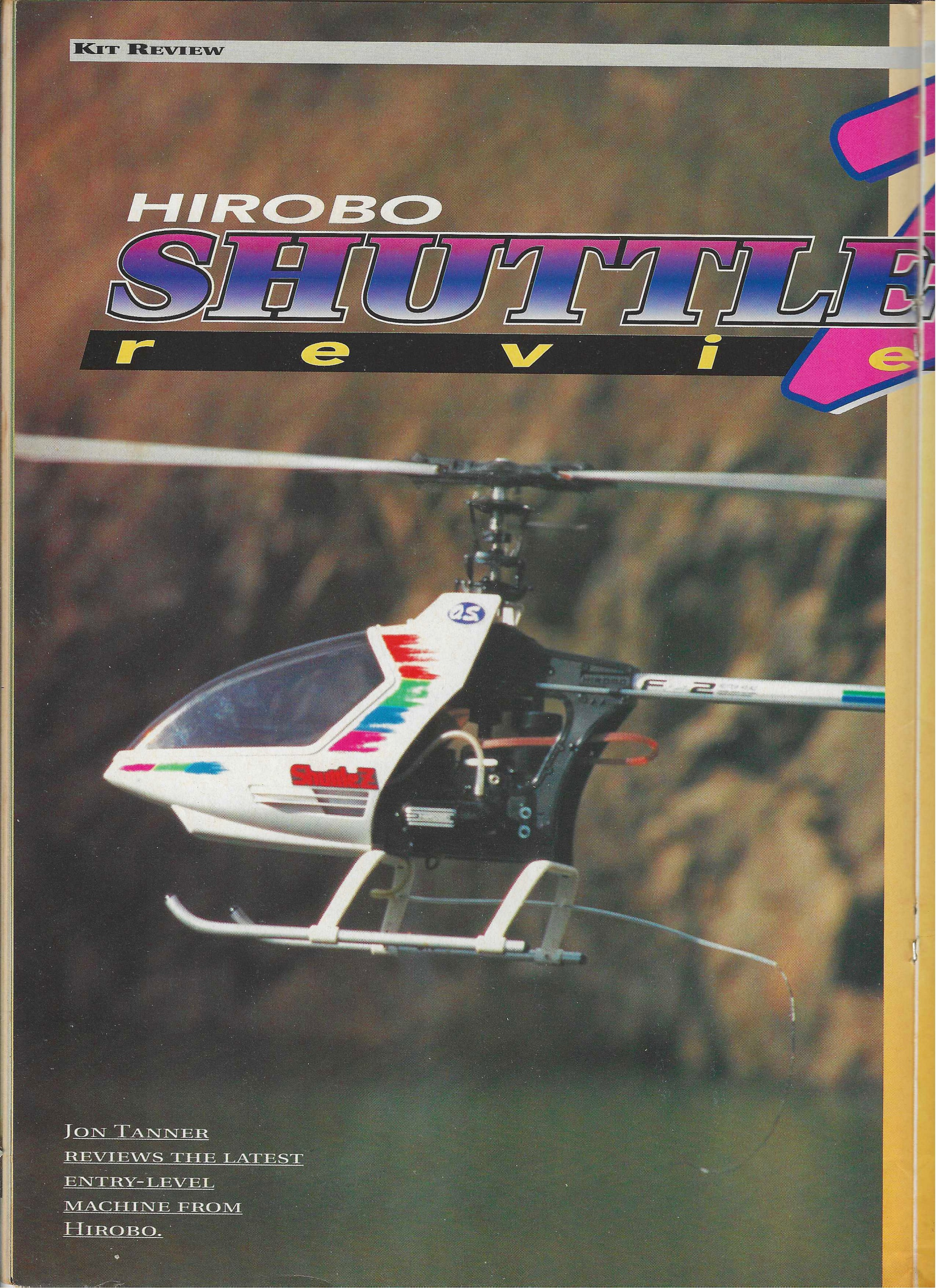
HIROBO SHUTTLE review



JON TANNER REVIEWS THE LATEST ENTRY-LEVEL MACHINE FROM HIROBO.

Introduction

The *Hirobo* 'Shuttle' is a name synonymous with the mid-80's revolution that heralded the tremendous growth of modellers accepting the challenge of flying model helicopters. The MK 1 'Shuttle' appeared in August 1985 and was the first of the '30' sized 'plastic wonders'. The name 'Shuttle' has continued throughout following generations of the model and, despite numerous developments, the appearance and layout has remained, to the extent that a 'Shuttle' of any vintage is instantly recognisable.

A 'New Shuttle' was introduced in November 1987 and my introduction to the model started with this version in 1988. I bought a 'Shuttle XX' that was the higher specification model, the 'Shuttle X' being the standard version. At that time it was possible to buy the model 'Almost Ready To Fly' (ARTF) and came complete with an engine. I was highly impressed with the 'Shuttle XX', both with its reliability and durability. There were a few areas that could have done with improvement, such as the early plastic clutch which needed replacement after about 7 -10 hours flying. The other part which needed regular inspection, and attention, was the tail pitch slider. This had to be regularly oiled or it would over heat and melt resulting in the loss of tail control. A limiting factor of the model was the amount of collective pitch available. This was due to the slots in the side frames which did not allow enough movement of the collective cross shaft and so limited the vertical movement of the swashplate. We filed the slot out to increase the collective throw by about 3 mm so that there was sufficient pitch range to auto the model.

The next generation of 'Shuttle' was the 'Shuttle new Z series' which appeared in May 1989 and comprised of the 'Z' and 'ZX' models. These had quite a number of changes such as, a new rotor head, side frames, longer boom and blades. There was also further development resulting in the introduction of the 'Gold' series of upgrades. All this activity culminated, at the end of 1993, with the 'ZXX' and Nick Papillon reviewed this model in the April 1994 issue of 'Model Helicopter World'.

On another theme, the past few years has seen the basic beginners model 'under-supplied' at a time when people's disposal income has been reducing. We saw manufacturers move towards more sophisticated, and hence expensive, models at a time when people were more cautious about spending money on a new hobby or model. This has been addressed during the past year or so by a number of manufacturers and *Hirobo* have addressed the market by introducing the latest version of the 'Shuttle Z' at a very competitive price.

The 'Shuttle Z' is *Hirobo*'s entry-level model, but is supplied with all that is necessary to take the beginner through to aerobatics and autorotations in a single package (less radio and engine). The rotor diameter is 1,100 mm as opposed to the 1,240 mm of its more sophisticated peers, the 'Shuttle ZX' and 'ZXX'. Other than this the dimensions of the 'Z' are the same and it uses the same gear ratio of 9.625:1:5.5. This economy package uses plain bearings in a lot of places, while the 'ZX' and 'ZXX' use ball races. The 'Z' can, therefore, be easily up graded to the 'ZX' or 'ZXX'.

The 'Z' can be easily up graded to the 'ZX' or 'ZXX'.

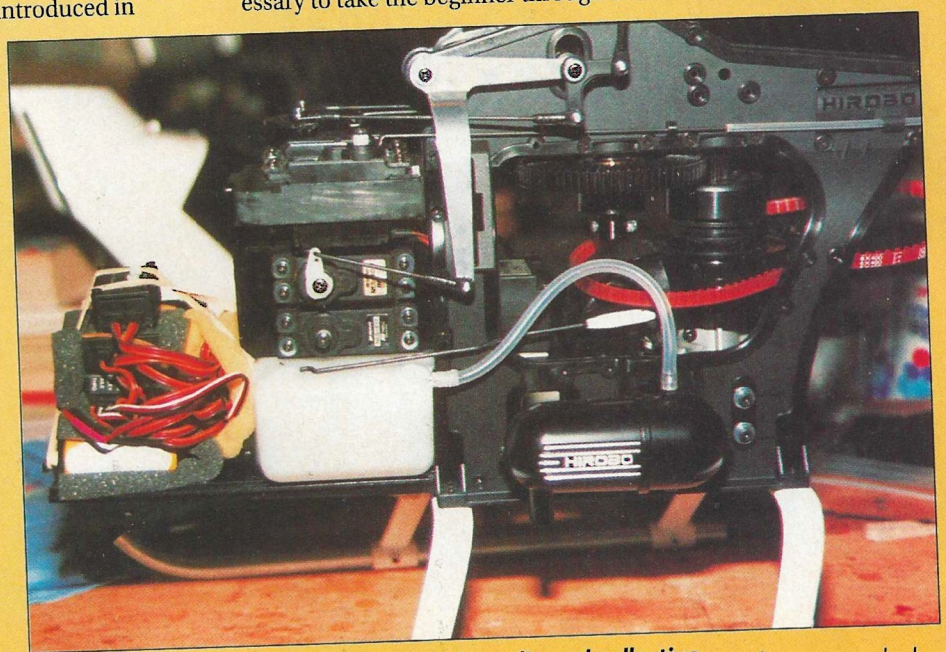
The 'Shuttles' are a '.32' sized model, using a singe gear reduction and toothed belt tail drive. An autorotational unit is included and starting the 'Z' is by way of a belt. A helicopter set of radio with five servos, plus a gyro, is recommended. Engine size is the popular .28 to .36 range and there are plenty of suitable engines on the market which will fit the 'Shuttle'.

The Review Kit

The review 'Shuttle Z' is a full kit in that nothing is pre-assembled. I have always liked building 'full kits' simply because you learn a great deal about the model during the construction and that gives you more to write about! Presentation is the well practised and popular method of putting the necessary parts for the various sections of construction into numbered bags that coincide with the numbered instructions.

When you open the box you find the Cabin, which is fitted with the screen, and a package containing the Instruction Manual, Decal sheet and other information. Delving further into the box reveals a large plastic bag containing a profusion of smaller plastic bags which often contain further plastic bags containing the parts. I like this way of packaging as it makes life much easier when building, but one of these days I'll count just how many bags there are in a kit, it must run into dozens and dozens!

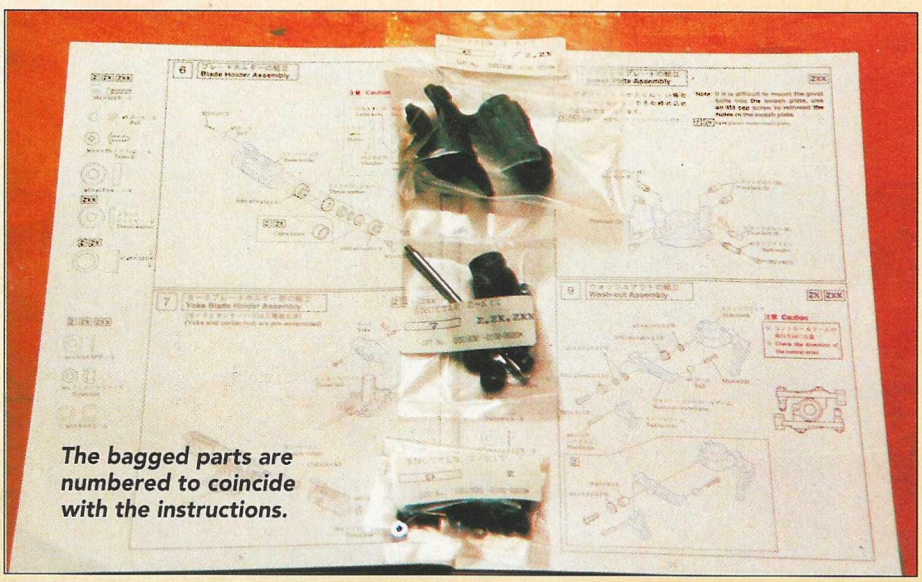
At the bottom of the box you find the boom, main rotor blades, flybar and tail control rod.



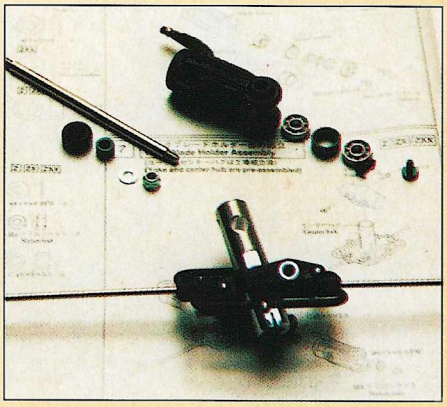
This shot shows the radio and collective linkage installation.

Building the model - but first the manual!

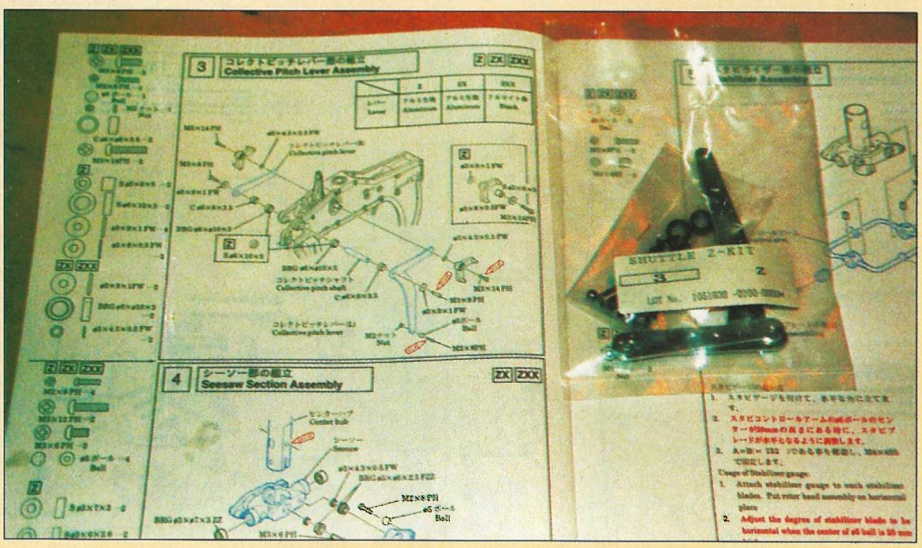
Opening the 68 page Manual (that covers the three variants) and you find a revelation in what makes a first class introduction to the building of a model helicopter. You are presented with excellent diagrams and notes on just about every aspect of the model you could wish for. I would go so far as to say, that a beginner will find all they need to know in this book. It covers the extra necessary items and tools, it explains how to differentiate between the various parts for the 'Z', 'ZX' and 'ZXX', there are sketches of all the screws, bolts, set screws, washers, bearings and spacers. The construction section dedicates a page of diagrams, with notes, to every part of the building sequence. There is a lot of attention to ►



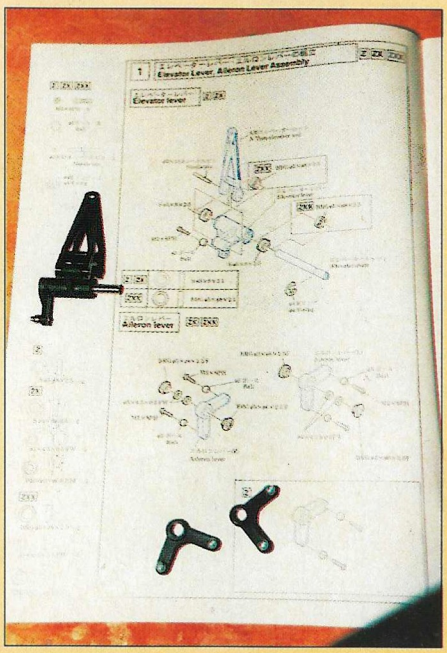
The bagged parts are numbered to coincide with the instructions.



Simple rotor head assembly.



On the left of the page you find the parts list for the three versions of the model that the manual covers.



First class construction manual

radio installation and setting-up procedures that extends to the pitch range using the supplied card pitch gauge. You then have safety advice and starting procedures and a flow chart for identifying minor adjustments and faults during the first flights. There is then another flow chart for maintenance which is followed by sections on how to replace parts in the event of need. Round all that off with a full parts list and you have one of the most comprehensive manuals you will find.

Construction

Construction starts with the Elevator and Aileron levers which use metal/plastic bushes as opposed to ball races on the 'ZX' and 'ZXX'. The frames are the same on all 'Shuttles', which is good as they, therefore, accept all the up-grades that make up the 'ZXX'. In addition, they are moulded to accept the radio on/off switch in an accessible position. The frames are screwed together using 3 mm nuts and bolts as well as self-tapping screws into plastic. The frames sandwich the two mast ball races and a single ball race that supports the clutch bell. The elevator lever, gyro mount and cabin lock are fitted at the same time. Added next are the collective pitch levers, one either side of the frames, and the aileron bell cranks. The collective levers support the elevator lever as well as the bell cranks.

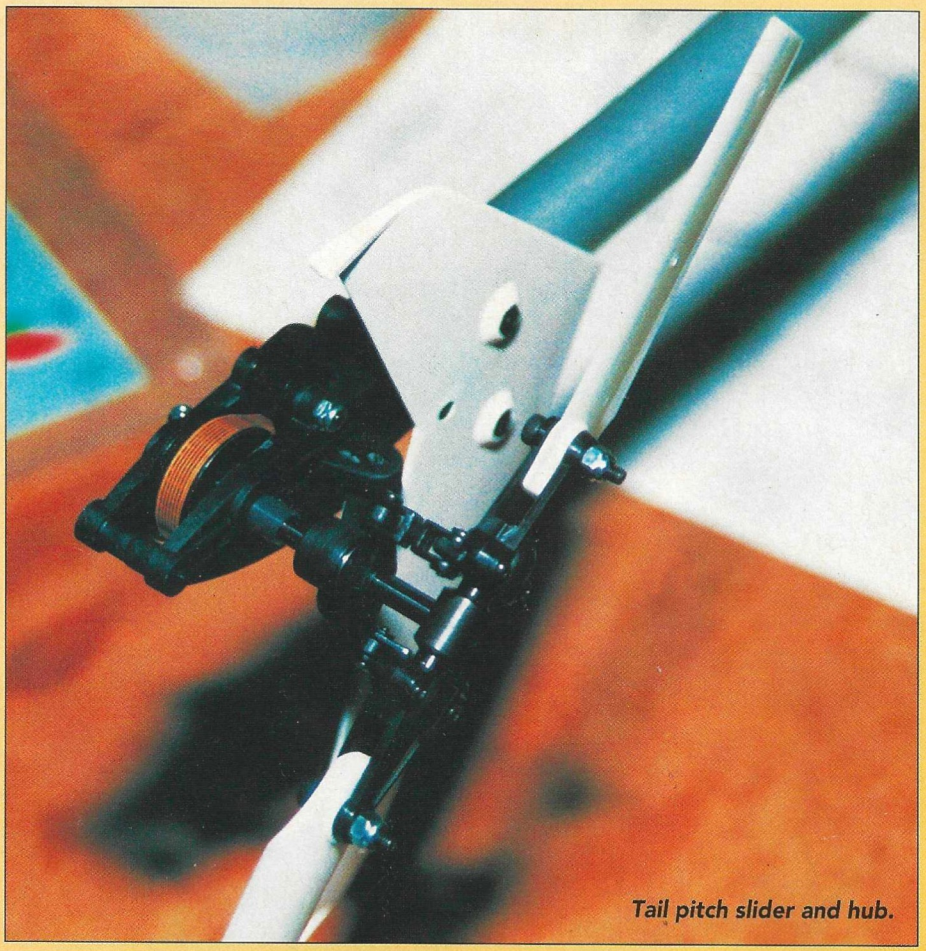
The elevator lever itself is worth a mention as the actuating arm on the new design is outside the frames. The earlier 'Shuttles' had this arm between the frames which made the control rod route a bit tortuous, the new lay out is much simpler and direct. Plain bushes are again used and, as you would expect, the instructions indicate where to use thread lock.

The rotor head

Now we come to the rotor head which uses plain bearings throughout. Careful assembly is needed and it's important not to over tighten the screws that hold the moving parts together as they can pinch the levers making them a little stiff. An improvement that makes life easier is the full 'all round' stabiliser control arm which avoids the need to line up the earlier two right angled brackets. This is a plastic item that has metal inserts which lock onto the flybar. These inserts have a flat on them which provides a positive lock in the control arm and hence, is a well designed improvement. The C of G corrected paddles are retained using 3 mm nuts and are covered with self adhesive film that partly cover the retaining nut. A new and useful aid to accurate alignment is two paddle alignment gauges which makes it easy to line up the paddles with each other and the stabiliser control arm.

The instructions rely heavily on diagrams with accompanying notes, all of which need to be understood before assembly.

The one piece moulded blade holders incorporate the pitch arms and are ribbed to increase strength. Twin



Tail pitch slider and hub.

ball races are used in each of the 'Shuttle Z' and 'ZX' while a thrust race replaces a spacer between the bearings in the 'ZXX'. The moulded yoke is a tight fit onto the aluminium centre hub and the solid feathering shaft runs through the hub and yoke, supported by rubber dampers.

A ready to fit plastic swashplate is supplied for the 'Z' and 'ZX' while a metal unit is supplied for the 'ZXX'. The wash-out assembly is assembled and again uses plain bearings. The rotor head, radius block, wash-out and swashplate are now assembled onto the mast and retained with the mast stop. I found that the swashplate and wash-out was a little tight on the mast but expected them to free up in use.

Fuel tank and servo mount assembly

The tank and servo mount assembly are very easy to assemble and the only comment needed is that the fuel tank is substantially larger than the earlier item and should give flight times in excess of 20 minutes.

All the above assemblies are then brought together, including the main gear that is pre-fitted with an autorotation bearing. This stage only takes a few minutes and, almost instantly, you have half a model that is recognisable as a helicopter.

Moving to the tail

Construction now moves to the tail where I found the only pre-assembled component - the tail hub was pre-fitted with the thrust races that support the tail blade holders. The tail gearbox is simple because the tail drive uses a toothed belt that drives the tail shaft, the belt simply loops round the drive pre-fitted pulley. Careful assembly and taking note of the cautions in the manual will ensure a smooth running assembly. One caution note that did confuse me says, 'Check the direction of the guide pulley'. As far as I could see, the pulley is symmetrical and it only rotates in one direction! The penny then dropped, it means that the pulley runs on top of the belt. One further comment is that a piece of silicon tube is slipped over the tail shaft, from the outside, up against the ball race. I was a bit mystified about the purpose of this.

Finishing off the tail assembly is straightforward and the model is supplied with a ballraced tail pitch plate which I know to be problem free. All that you need to be careful about is that you don't over tighten the link pins that connect the pitch plate to the blade holders and to make sure that retaining set screw that locks the hub to the shaft engages in the dimple on the shaft - use threadlock on it!

The completed tail box can then be fitted to the boom which is held in place with the fin. A slot in the boom engages with a boss on the moulding which ensures that the box cannot rotate.

Fitting the tail

First the clutch bell is slid up through its single bearing, that is already located in the frames, the spur gear engages with the main gear and the pulley is then slid over the pinion shaft. A quarter turn of the tail belt is required for it to engage with the drive pulley, I find the easiest way to do this is to establish when the belt has no twist at all. Do this by running it round your finger. Now rotate the belt a quarter of a turn **clockwise** and with the belt in this position, feed the boom between the frames all the way in, locating the slot over the boss on the frames. The belt can now be slipped over its pulley. Next, the special plastic washer is fitted (with the bevelled side down) and locked in place with a M3 x 6 bolt.

Time to check that the twist is in the right direction! If you rotate the **main gear** clockwise as viewed from above, the tail must rotate anti-clockwise when viewed from the right. If it goes the other way, you twisted the belt the wrong way. If the belt makes a clicking sound, you rotated it more than a quarter of a turn.

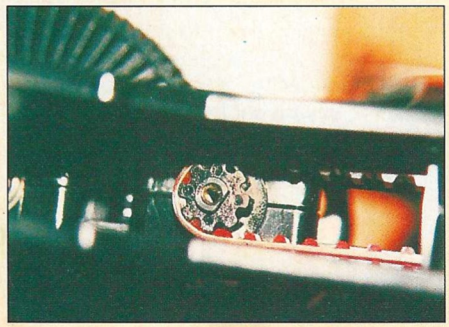
Finally the boom is eased out so that the belt is tensioned correctly. The correct tension is when one side of the belt can be pushed in to the centre of the boom, but without it touching the other side of the belt. This is done between the frames behind the drive pulley. The sketch in the manual clearly shows this important step.

Careful assembly is needed and it's important not to over-tighten the screws that hold the moving parts together as they can pinch the levers, making them a little stiff.

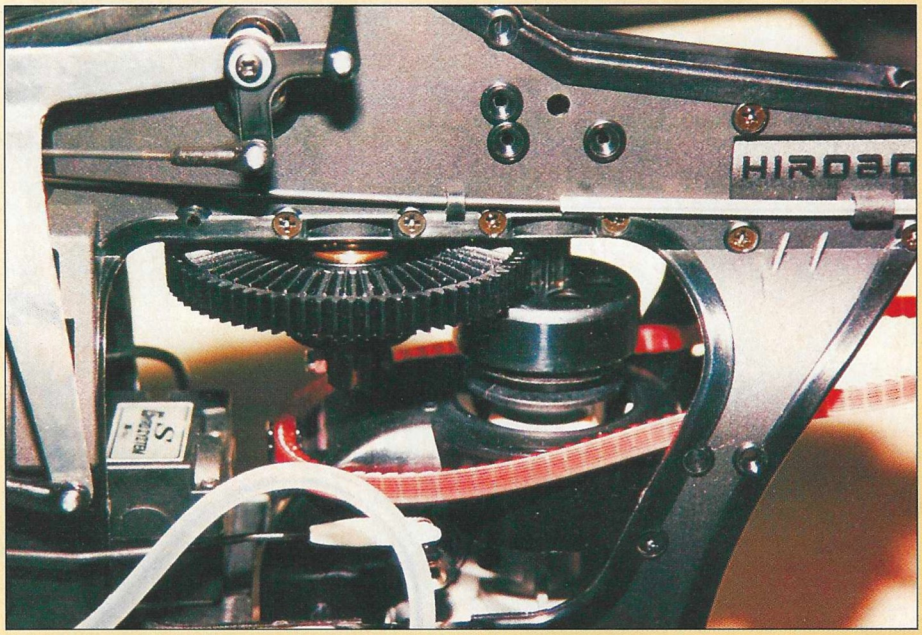
Motive power

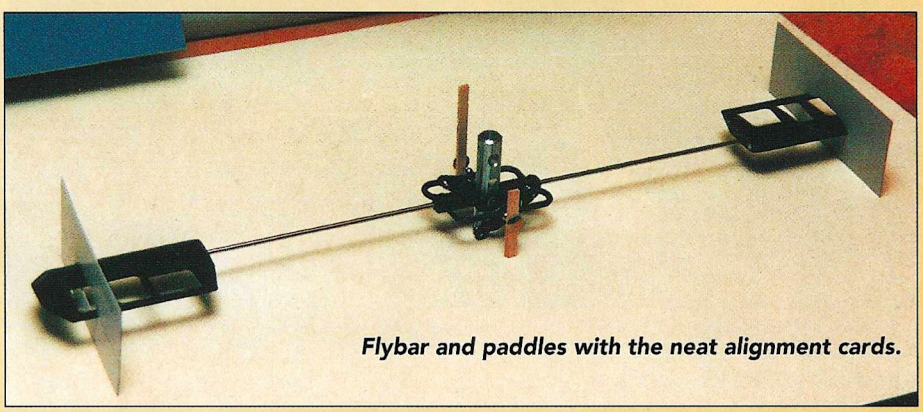
The 'Shuttle' will accommodate any of the '30' sized engines currently on the market, although the silencer that comes in the kit is made to fit engines having manifold bolt spacing at 35 mm. My choice was to use the *OS* '32 SX-H' which is a first class engine and is one of the most powerful on the market - as proved in Mike Billinton's test last issue!

First job is to assemble the cooling fan ▸



Tail drive pulley with the toothed drive belt. This is where to check the belt tension.





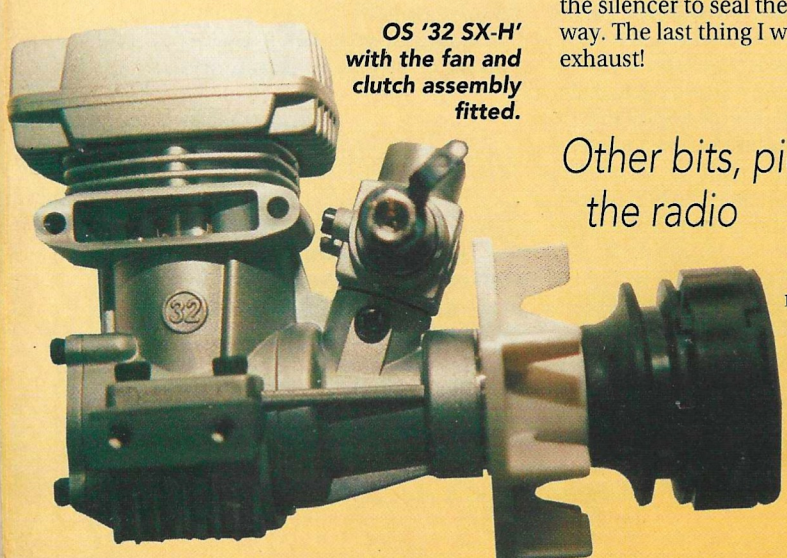
Flybar and paddles with the neat alignment cards.

and clutch assembly to the engine. The 'Shuttle Z' uses a plastic clutch assembly which engages directly with the metal clutch bell and also incorporates the starter pulley. Assembly is straightforward although fitting the twin shoes and circular clutch spring is a bit of a fiddle. I have a slight reservation about the continued use of a plastic clutch, which previous experience showed to have a limited life. This is particularly so when using a powerful engine such as the *OS* '32 SX-H', the original plastic clutch was used with .28 engines that delivered substantially less power. The 'Shuttle ZX' comes with a one-piece metal clutch engaging with a 'Ferrodo' type lining, as does the 'ZXX'. It was going to be interesting to see how well the clutch would stand up. At the same time as fitting the clutch, the engine is also bolted to the ribbed aluminium engine mount.

The fuel tank is substantially larger than the earlier item and should give flight times in excess of 20 minutes.

The completed engine and clutch assembly is slid between the frames from below, after the cooling shroud has been fitted. Don't forget to fit the starting belt as well! It is very important to line up the engine assembly with the clutch bell. It must be located as high as it will go, but without putting pressure on the bell. The slots in the side frames allow a little lateral movement in the engine location and this can be used to ensure that the centre line of the clutch lines up with the centre line of the bell. Viewing from the sides and front will enable you to align this as accurately as possible and if you spin the main gear, the bell should run true. It's worth taking a bit of time over this as it will pay dividends in the long run with improved reliability and durability.

Once the engine is in place the silencer can be fitted and I took the trouble to seal the joins with heat proof epoxy and split the silencer to seal the join in the same way. The last thing I want is a leaking exhaust!



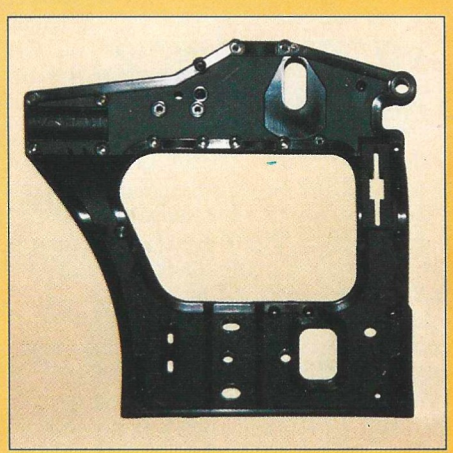
OS '32 SX-H' with the fan and clutch assembly fitted.

Other bits, pieces and the radio

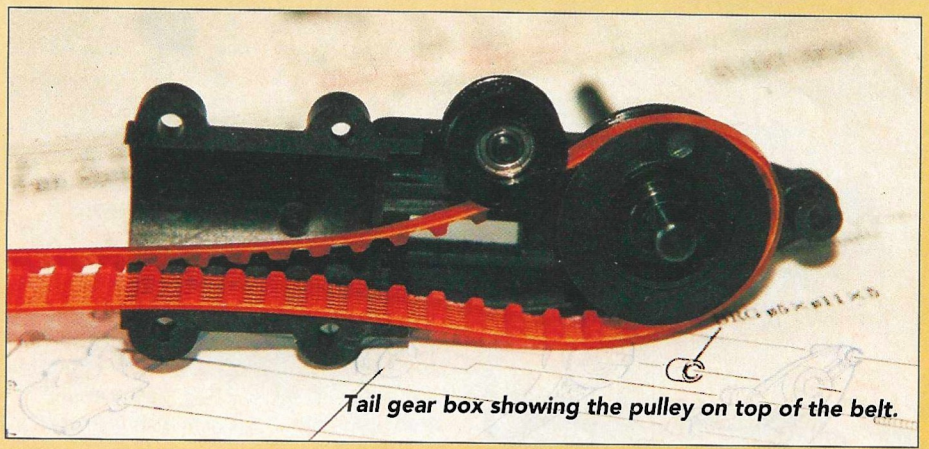
Plastic undercarriage legs screw to the side frames and aluminium skids locate into the legs. Simple and strong.

At the same time as fitting the horizontal stabiliser, the tail control pipe is also fitted. This long plastic pipe locates at the tail gear box, the stabiliser bracket and at the sideframe.

Unweighted blades with a semi-symmetrical section are supplied in the kit. These are not laminated, but are machined from solid hard wood and weighed 59.5 gms and 59.4 gms, that is what I call 'well matched'! Heat shrink tubing is supplied to cover the blades before the plastic root mouldings are bolted in place. I impregnated the root area and holes with thin cyano to increase strength. The finished weights came out at 71.5 gms and 71.8

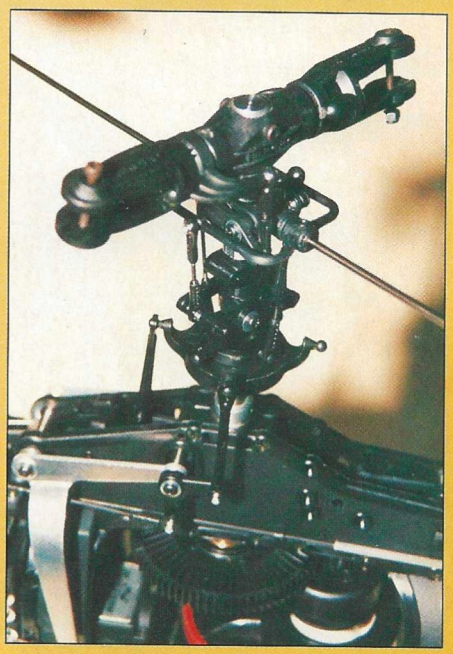


The new side frame



Tail gear box showing the pulley on top of the belt.

The plastic clutch assembly

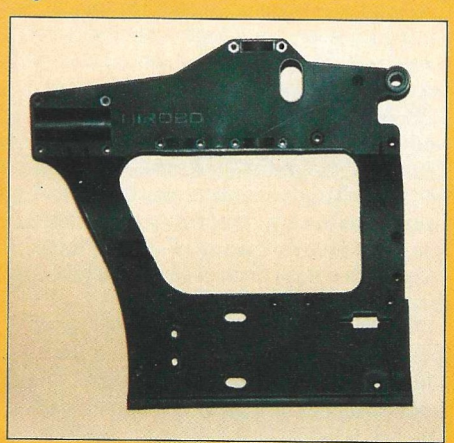


Complete rotor head assembled.

gms. which is well matched and should suit the beginner well. Plenty of guidance is supplied about balancing the blades and using the supplied tracking tape.

A full page is given to making up the linkages that use a combination of ball links and 'Z' bends. A very nice touch is that lengths are given for *Futaba*, *JR* and *Sanwa* servos.

The first rod to be installed is the tail control which slides down the tube from the front. This is a long run that bends slightly and makes the rod rather stiff, time would tell whether it needs modifying.



The original 'XX' side frame. Note the shorter collective slot at the top.

Finished tail assembly with the exposed toothed belt.

Installing the radio equipment is straightforward and well covered in the manual. The only area I disagreed with was the use of double sided tape and a single rubber band to retain the battery and receiver. I preferred to wrap the radio items in foam and secure the bundle with bands.

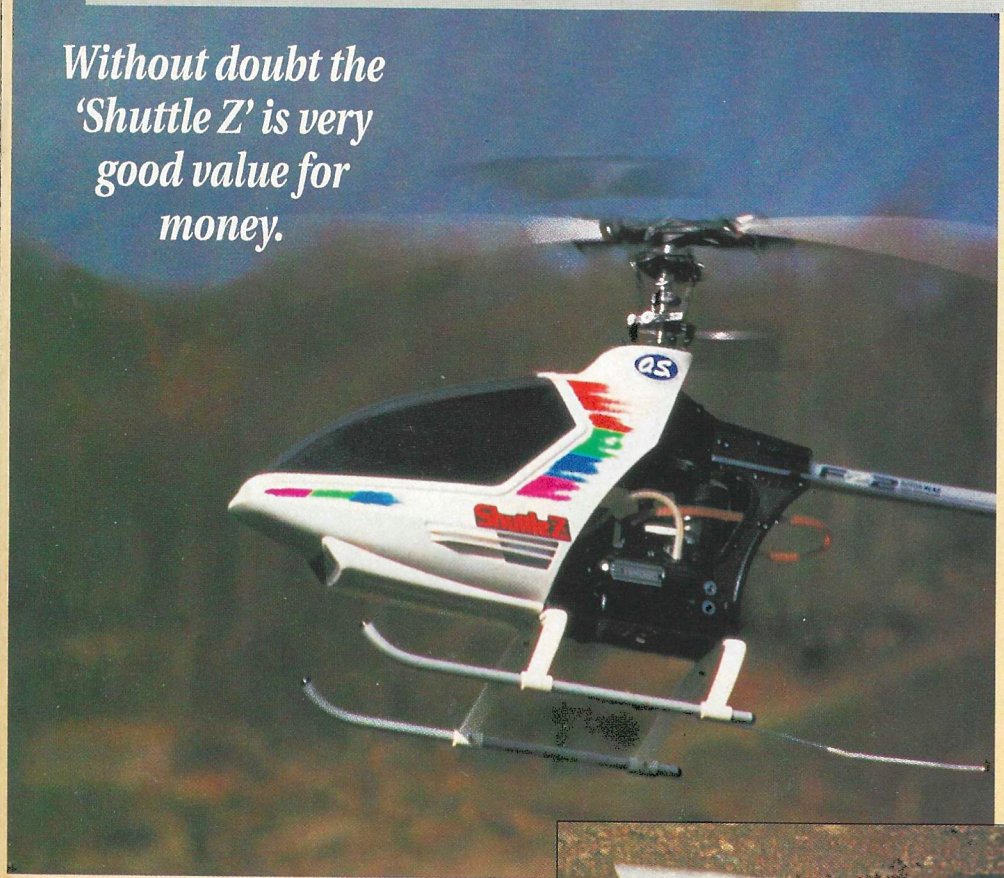
Fitting the rest of the rods and setting up is extremely well covered and leaves nothing to guess work. This guidance extends to setting up the pitch range and a neat card pitch gauge slots into the blade grips allowing preliminary settings.

Assembling the model exactly according to the manual resulted in a pitch range of about -2 to +15 degrees. I reset the adjustable pitch arm rods to give -5 to +12 degrees. However, it is possible to increase the total throw to about 20 degrees by altering the collective mechanical set up. This is touched on in the manual and can be achieved either by using a longer servo arm or raising the ball link on the collective lever.

Full guidance is given to setting up the pitch range for four flight modes. Throttle and rudder pre-settings are also provided.

This area of the manual is the only part where a beginner might have difficulty, simply because it will be too complex for them. A raw beginner is unlikely to know what 'Mode I' and 'Mode II' are, let alone the difference between 'Hovering', 'Idle ►

Without doubt the 'Shuttle Z' is very good value for money.



Up 1', 'Idle Up 2' and 'Autorotation' pitch settings. You would also expect a beginner's radio to be pretty basic and so is unlikely to have four flight modes! Perhaps a simplified set of guidance for a beginner wouldn't go amiss, showing a reduced range of pitch settings. A beginner really only needs -1° at bottom stick, +5.5° at mid stick and +10° at top stick.

All that is then left to be done is to apply the decals to the cabin and tail surfaces, to check the C of G (which should be on the mast), and a final check that everything is as it should be.

All up weight, without fuel or blades, but with a 1200 mAh battery, came out at 2,500 gms. 200 gms more than specified.

Building summary

Looking back, every part fitted correctly without difficulty. You do need to be accurate when assembling the various mixers and bellcranks as an over tightened screw will cause problems. This makes the use of threadlock necessary where the screws are metal to metal.

The instructions rely heavily on diagrams with accompanying notes, all of which need to be understood before assembly, otherwise an important point can be missed. All the necessary information is in the manual and it's best to interpret and 'mentally assemble' the parts first. If you study the instructions first you won't go wrong.

Nothing was missing in the kit, but there were two self-tapping screws too many, much better this than too few! Without doubt the 'Shuttle Z' is remarkably straightforward and quick to build. Full marks in this department!

At the field

There has to be nothing worse than having a newly completed model sitting for three weeks waiting for reasonable flying weather! Eventually, when the gales subsided, the rain ceased and the local flying field was accessible without any sub aqua gear, I finally got to fly the 'Shuttle Z'.

With the engine running and the blades turning, everything looked good so a bit more power was given and the rotors came up to speed. With the model light on the skids I checked out the control response. Everything was working and I noted that the controls felt fairly 'soft'. A little more power was applied and the 'Shuttle Z' lifted off into a hover without making a drama out of it! First impressions was that it felt a little tight and the control response is definitely soft. The tracking was out by one turn and with this corrected the model felt better and sat in a steady hover.

A second tank of fuel saw the engine beginning to free up so I leaned it out slightly and now had a smooth running engine. The improved running showed itself in the model and I tried a few low slow circuits. This showed that the controls were well harmonised and that the head speed of about 1350 RPM was quite adequate for hovering and this type of flying. It also showed that the piece of tube over the tail shaft had a damping action on the tail. The tube restricts the amount of tail pitch movement and I had expected it to limit the ability to turn right. As it was there is adequate tail authority and the slightly stiff tail pitch rod did not manifest itself as a problem.

The controls were still tight which showed itself by the response being a little sluggish and the collective being a little vague, but for its first two tanks of fuel it was well on target and ready for some flying shots.

We have all heard of, and got fed up with, talk of British weather. Well it did it again, wind, rain, snow and sleet confined a photograph session to a dream; until one Thursday morning when the sun was out and I had the day off work! A call to Traplet Towers and the Emotive Enigma Daydream was soon in my car, we hurtled off to the well known and loved quarry that is a most wonderful and hazardous setting for model helicopter photography. (Local rumours have it that, concealed beneath the murky surface, is a drowned JCB). As with all such sessions everything went splendidly well including seeing the 'Shuttle Z' ascending quite merrily when I had already reduced the collective - strong rising air currents creating an ascending auto! In the end all was well and we survived with a mild dose of Excessively Exacerbated Delirium.

With the flying shots 'in the can', the following flying sessions resulted in the controls settling down and the engine smoothing out as it gained more air time. The *OS* '32 SX-H' is a really excellent match with the 'Shuttle Z' and to date the plastic clutch has stood up to the test.

Starting with a belt requires a knack and I found it easier to use the starter up side down (with the battery leads reversed!) to make sure the starter lines up with the pulley. If the belt doesn't line up properly then it will run out of the pulley.

As the rotors speed up, I have noticed a sideways oscillation which disappears well before the rotors reach flying speed. This is nothing to worry about and I have seen it before on many models, particularly on those with plastic undercarriage legs. As mentioned above, the 'Shuttle Z' uses the full length boom, without boom stays, and short main blades which is an interesting combination. When maintaining a low head speed, the boom has not shown any signs of shaking or oscillating in any direction and so does not need boom stays! The short blades produce plenty of lift and the semi-symmetrical section contributes to the smooth flying characteristics of the model. With the *OS* '32 SX-H' on song, a lot of top end pitch is needed to absorb the power without the head revs going through the roof. Higher head revs do not worry the model and makes the model more responsive, however the supplied main blades tend to become unstable at higher revs.

As far as aerobatics are concerned, loops and rolls are predictable without giving any unexpected outcomes. A better set of main blades are needed, if quick and snappy manoeuvres are the order of the day then a head speed of about 1600 RPM will produce a snappier response. For practising autorotations, I would advise the use of longer rotor blades (i.e. the 'ZX' blades). The standard short blades are rather light for this manoeuvre and there is not much reserve of energy if you misjudge things! For '3D' and more advanced precise manoeuvres, the up-grades may be called for, which will improve the precision of the model. The 'Shuttle Z' has the same potential as the 'ZX' and 'ZXX' in terms of response and so is capable of all that these versions can perform - which is an awful lot if you watch pilots like Mark Leavesley.

Summing up

Without doubt the 'Shuttle Z' is very good value for money, particularly as it includes the autorotation unit and, if you shop around, is available for well under £200. For anyone who is looking for a model to start out with, it has to be high on their list of 'possibles'. From that point of view, it is a well tied and tested model that has the advantages of a tall mast, a semi rigid rotor head (reducing the risks of boom strikes), simple building, first class instructions and good availability.

On the critical side, I would much prefer to see a metal clutch and I hate belt starts! These are minor gripes when you consider the cost of the model and both can be improved upon by the owner when the time is right. The same is true of the extensive use of plain metal/plastic bushes. Ball races are more precise and last longer but in my experience plain bushes will last a long time and are cheap to replace. Whereas the supplied rotor blades are fine for learning, hovering and slow circuits, a better set is adviseable for more advanced flying.

When I think back to my 'Shuttle XX' of 1988 and try to compare the two, the 'Z' is smoother and more sophisticated than my memory of the 'XX'. Flying the 'Z' brings back memories of my early experiences so they can't be that much different. That has to good news because I had great fun and learnt a lot with my 'Shuttle XX' and so anyone who buys a 'Z' will be bound to do the same. □

Jon Tanner

SPEC CHECK

PRODUCT:	'Shuttle Z'
MANUFACTURER:	Hirobo Limited, 530-214 Motoyama-Cho, Fuchu-Shi, Hiroshima-Pref, Japan.
UK IMPORTER:	Irvine Engines Ltd., Unit 2,Brunswick Industrial Park, Brunswick Way, New Southgate, London.
MAIN ROTOR DIAMETER:	1,100 mm (44.8 in)
TAIL ROTOR DIAMETER:	225 mm (8.8 in)
OVERALL LENGTH:	1,403 mm (55.2 in)
ALL-UP WEIGHT (DRY):	2,300 g (5 lb 1 oz)
MAIN GEAR RATIO:	9.625:1
MAIN TO TAIL GEAR RATIO:	1:5.5
CONTROL REQUIREMENTS:	5 servos and a gyro
POWER REQUIREMENTS:	.30 class two-stroke glow engine

MHW STAR RATINGS

SPECIFICATION:	★ ★ ★
KIT QUALITY:	★ ★ ★ ★ ★
INSTRUCTIONS:	★ ★ ★ ★ ★ ★
BUILD QUALITY:	★ ★ ★ ★ ★ ★
FLIGHT PERFORMANCE:	★ ★ ★ ★
VALUE FOR MONEY:	★ ★ ★ ★ ★ ★
OVERALL	