Kalt 'Enforcer ZR' kit review

Some five years ago, I was fortunate to review one of the first Kalt 'Space Baron' kits to arrive in this country. It was supplied in ARTF form, fitted with a Webra '28'. I liked the model very much, and used it for my first attempts at '3D' flying.

While it was more than capable of this type of flying, it began to show signs of reduced reliability with a couple of in-air failures. I rather lost confidence in the model as a result (as far as 'chucking it around' was concerned) and passed it on to a beginner in the hope of generating some notes on learning to fly. The model is still going, but the budding pilot still has not found the perseverance needed to master hovering.

There were times when I found myself rather missing the model and hankering after the 'Space Baron S' which had replaced it in the Kalt range. Therefore, when the opportunity arose to review the American version of this machine, the 'Enforcer ZR', I leaped at the chance. It needed little consideration to decide that the motor would be a Super Tigre 'G34H' and, after discussion with Dave Wilshere, I was told that I would fit a Weston silencer!

The Kit

As the earlier model had been the ARTF version, I was rather pleased that the 'Enforcer' was a full kit version. This followed the familiar pattern of bags of components, which matched sections in the instruction manual. However, instead of the usual system of numbering the bags and instructions, you are merely instructed to look for the bag with such-and-such a part in it and screw bag numbered 'X-X'.

Those who are familiar with the 'Space Baron' can skip the next part. The transmission is quite novel and has three brass planetary gears, each with tiny roller races, mounted on the auto unit below the nylon main gear. These run inside a toothed ring which is, in turn, located in the gearbox casing, In use, the clutch pinion drives the main gear - which is independent of the main shaft - which has a pinion which drives the planetary gears around inside the toothed ring, thus taking the auto unit, and the shaft, around with them.

This arrangement is incredibly efficient. There is less drag in the whole transmission than there is in the auto unit - which means that the tail doesn't stop during an autorotation. The tail drive is taken off from a bevel gear on top of the main gear. The tail drive take-off gear appears to be identical to the input shaft on the tail rotor gearbox. Each has a slot in the end of the shaft to accommodate a

loop on each end of the tail drive shaft, which makes removal of the boom or tail box very easy. This drive shaft is supported by four plastic bearings which are a push fit in the tailboom.

Both the main gear and the clutch pinion have bevelled teeth with the result that the motor and clutch are angled forwards. This serves two purposes:
a) The starter cone is accessible by a normal starter and no extension is needed.
b) There is a natural airflow down past the motor, which aids cooling.

There were several changes in the clutch design on the original machine, culminating in a one-piece metal 'Mark III' design, which worked superbly. This is the design which is now standard on both the 'Enforcer ZR' and the 'Space Baron S'. It still works beautifully, with just the right amount of 'take-up'. Clutches have long been the weak point of model helicopters and it is a delight to find one that really works.

Apart from the clutch pinion and the planetary gears already mentioned, all of the gears are a white 'soapy' plastic, which works very well. The gears at the ends of the tail drive shaft are a one-piece moulding which incorporates the shaft which runs in bearings. The only gear in the whole system which is actually attached to a shaft is the tail gearbox output shaft. The gear actually extends along the shaft and serves as an integral spacer to correctly position the gear between the two halves of the gearbox.

The servo cradle is mounted at the same angle as the motor and this allows all of the linkages to follow a straight line to the various control bellcrank. In the tail linkage the transition to a direct fore and aft motion is taken care of by an intermediate bellcrank which has the required differential built into it. This also serves as a point where the tail control can be disconnected for removal of the boom. The biggest single difference between the 'Space S' and the 'Enforcer ZR' is in the rotor head. The 'Enforcer' head has one piece blade holders and an extra flexiplate on each side, mounted below the original plate. It is not actually connected to the blade holder, but rests on the head of the feathering spindle retaining bolt, which is inserted from below - which means that the nut and the unshielded end of the bolt are now on top. The main result of this is that you rip the palm of your hand to pieces if you use it to stop the rotor head! The intended purpose is to reduce the possibility of a boom strike!

It is interesting to note that the only drawing in the entire assembly manual which actually shows this arrangement is the one which tells you how to put it together. Every other drawing shows the single plate arrangement, as used on the 'Space Baron'!

The collective control is achieved via a rod up the centre of the hollow mainshaft. For a fixed swashplate system, this is probably the optimum arrangement. The rod rotates with the shaft and has a bearing at its lower end, which is fitted to the pitch cradle between the side frames. This rod is of fixed length and there is no adjustment at this point. If you aim to fly '3D', it is necessary to arrange the servo linkage and the various head linkages so as to obtain the maximum possible movement in this rod and then adjust the blades to suit.

On the original 'Space Baron' I had no problems with this set-up and was able to achieve a symmetrical pitch movement, with zero pitch on the blades at the centre of the travel. With the 'Enforcer' I found this to be a little more difficult and I never did get things the way that I wanted them, even though I still had the original settings stored in my transmitter. There is something different, and I believe it is the length of the links from the swashplate to the mixer, which are not adjustable.

Assembly

This was very straightforward, following the manual. As usual, there is very little point in rewriting the manual, or going over everything in detail. The salient points are as follows:

A certain amount of fiddling was needed to get the fan shroud/cooling duct to clear the fan. The shroud is only fixed at one point and simply fits between the side frames, with the aid of some positioning spigots. It actually sits a little too high and it is necessary to remove some of the material from these positioning aids. In this particular kit, the angle between the top of the shroud and the downwards extension was a little less than the necessary 90 degrees, which did not help. I thought I had licked it, but after a few tanks of fuel I discovered that the fan had worn right through the underside of the duct. There is no real need for the duct to extend under the fan so I cut away the worn material.

At this point, I remembered that my earlier model came with an instruction to drill out the hole for the one fixing bolt, to allow for some adjustment in the positioning of the duct. This could well have done the trick on the 'Enforcer'.

The swashplate mounting system, together with the mixer and washout unit all use screws which are threaded into plastic. In some cases, these have bearings and you can just tighten the screw. In other instances, the degree that the screws are tightened can have a great effect on the freedom of movement and the degree of slop, so tighten carefully and check frequently. It also pays to check these after every few flights.

The main blades supplied in the kit are 'fully finished'. They are of the usual composite wood construction, but with the leading edge made from a hard, laminated material. The tip is cut off at an angle. They are covered with clear heat shrink material and have bolted-on plastic root cuffs. Fine, except that the instruction manual is quite specific that they must be modified! First, you must cut around the cuffs with a scalpel blade (?), then remove them and remove the heat shrink material which was under the cuffs. The cuffs are then glued and bolted back in position. My first reaction to this was that the scalpel blade procedure was extremely hazardous, as it would be very easy to weaken the rotor blade, so I marked around the cuff with a felt-tipped pen instead. However, when I removed the cuff to see whether there was a better way of doing things, I was horrified! There are three large holes through each blade, under the cuff, leaving very little wood to take the load. Mindful of the fact that this was a kit review and that I couldn't condemn something without trying it, I carefully cut and removed the heat shrink within the marked area, so that the cuffs overlapped the material. I then glued the cuffs on with thick 'UFO' and replaced the bolts.

Two extra points:
a) The cuffs are plastic and give no support for the blade fixing bolt - which is a plain threaded type. I replaced these with a bolt having a plain shank through the blade.
b) If you proceed as instructed, there is nothing to retain the heat shrink material and it can slide off the end of the blade.

Checking the balance of the now fully finished blades showed that they were not too far out, but there was a difference of almost half an inch in the span wise CG location. At this point, they weighed 90 grams each. This was not the end of the story. See later.

Installation

All of the servos are mounted on a custom designed cradle which also includes a switch plate. If you use JR 'NES-517' servos, as I did, there is just room to accommodate these back to back and the

extra wiring can be squeezed into the space under the fixing lugs. By this means, a very neat installation can be achieved.

All of the linkages are fully described and the length of each is given, both as a dimension and a full-size drawing. The lengths of the servo arms are also detailed. In the setting up instructions, it is suggested that all linkages should be set to be parallel, or at 90 degrees to each other, and the blade pitch set to +6 degrees. For '3D' flying, you may consider setting the blades at 0 degrees, to give the maximum flexibility in setting the pitch range.

Some considerable variation is possible in the positioning of the receiver, gyro and battery pack. The intended position of the gyro is immediately under the mainshaft and a clear plastic cover is supplied for it. Some gyros will not fit under this cover notably the Quest unit. However, both of the machines that I have built have used this unit, with the cover simply left off. The snag here is that all of the wiring has to circumnavigate the cooling duct. With other types of gyro, particularly the 'three box' configuration commonly employed, only one set of wires has to go around the duct.

This particular helicopter design does tend to be rather nose heavy. The longer boom has helped somewhat here, but the use of a large battery will not help the situation. For this reason, I have used the JR 700 mAh battery pack, mounted under the receiver, which gives adequate flying time if always fully charged. Some people have mounted a larger battery in the gyro location as an alternative arrangement, with the gyro mounted at the front. One other possibility is to mount the tail rotor servo at the rear of the side frames. There are several variations on the theme available from the 'add-on' market. My own view is that it would complicate the wiring even more and lose the advantages of the 'servo module' which is a feature of the design. Various claims are made for this 'improving' the tail response, but I can find nothing wrong with the standard tail!

For convenience, it is a good idea to fit a remote glow plug connection. A 'phono' socket will fit conveniently into one of the recesses in the side frame, with a very short earth connection to one of the backplate screws on the motor.

Flying

The new 'G34H' proved to be a little reluctant to start at first, but this turned out to be a plug with a very tarnished lower turn on the element. A new one rectified that. At first, this motor tended to be very rich in the mid-range. The usual modification of turning the fuel inlet section in the carb until the fuel nipple pointed at the front fixing bolt fixed that one. This is a standard modification, for the Super Tigre, as recommended by Mick Wilshere. I'm surprised that Mick doesn't do this to every one before sale.

As per my usual practice, I am running without silencer pressure. The tank 'furniture' includes a neat filter, with a filling nipple on the inlet side. This coupled with one of those neat Kalt in-line shut-off clips, which isolates the motor while you fill the tank, works very well. So well, that I intend to go on using it, despite my dislike of filters on the model. Perhaps I shall just remove the filter screen!

It took quite some while to get the model set up to my liking and to acquire some confidence in it. This is almost entirely due to the aforementioned main blades, which in the supplied form (see above) caused a very pronounced shake at all speeds and refused to stay in track. In an attempt to rectify this, I added equal amounts of blade covering material to opposite ends of the blades until the lengthwise CG's matched. I then added more material at the CG of one blade until they balanced. This produced a very marked improvement, but I was very reluctant to run the model at the sort of revs which it prefers, in fear of the blades flying off - they now weighed 103 grams

Having gone on at length about the rotor blades, it is only fair to point out that, like most things, this is really a matter of luck. The base material is wood which, by its very nature is variable. The variation in CG position is almost certainly something which was a peculiarity of this particular set of blades. I understand from Horizon Hobby Distributors that they are well aware of the problem and that the blades are being redesigned to eliminate it.

I really am not sure that I can tell any difference in the longer boom and blades. My original 'Space Baron' always autorotated well and I never experienced a boom strike from this reason. Likewise, I am not sure that the extra head plates make any difference and I am not prepared to deliberately find out! My opinion is that, if you cannot tell the difference, then they are unnecessary. Interestingly, a lot of people seem to be adding them to their 'Space Baron S' models, so they obviously think them to be worthwhile.

A close examination of the geometry indicates that any tendency of the blades and blade holders to drop makes the head of the feathering spindle retaining bolt move along the plate, rather than pressing down on it. In fact, the only thing which stops the blades from dropping down and hitting the boom is the end of the extra plate hitting the inner end of the blade holder - hardly a good thing. Number two modification, after finishing this review, will be to convert the head back to 'Space Baron' configuration. In case you are wondering, number one modification is to throw away those main blades!

Performance with the 'G34H' is very good, once 'on the pipe'. There is a period of richness when opening the throttle from cold, which probably explains the complete, and welcome, absence of any tendency to 'hang on' when the throttle hold is operated.

The performance is everything that I remembered from the original 'Space Baron' and, with the ‘G34H’; the power is more than adequate. One of the failures of my particular original model was the loss of one of the pins which secure the swashplate links to the mixing arms. These pins are merely a friction fit in the plastic moulding, which does seem to work on the majority of machines. On the 'Enforcer', one of the pins began to creep out of position after only a couple of tanks of fuel, so I modified them by drilling a hole in the plastic moulding and placing a small drop of cyano into it so as to secure the pin. It helps to file a flat, or a nick, on the pin at the centre point, which helps the cyano to find its way in.

The familiar up and down shake of the tailboom, which seems to be a characteristic of all 'Space' models, is still there when the wooden blades are used, although only at some speeds. However, changing to either NHP blades, or G-Blades, cures this completely, which would appear to confirm my own theory that this problem is due to the use of blades having different chord-wise CG positions.

All the usual helicopter manoeuvres are possible with this machine. Those of you who have seen the Kalt (UK) team in action will be well aware of this. In autorotation’s, the very soft driven tall lets you steer the model to some extent. Enough, in fact, to make a radio with a tail offset facility a desirable feature.

A future up-date of this review will include the fitting of the above-mentioned blades, together with Power Products metal mixer parts and a Midland Helicopters 'Tru-spin' fan.

Conclusions

I liked the model very much in the original (European) form and this American version has exactly the same appeal. I have much more confidence in the design now that it has one-piece blade holders, which should allow it to be revved at the sort of speed which it likes.

As a result of a long association with the original 'Space Baron' and a longer than usual time to get to know this review kit, the above review may tend to sound a little critical. In fact, this is an excellent general purpose machine, and typical of the current generation of '30' size machines. Apart from the largely cosmetic head changes, which are easy to change back, my only real criticism is of the main blades supplied in the kit, which really are not up to the standard of the rest of the machine.

Many people seem to like the decals supplied with the 'Enforcer' kit and they are finding their way onto many of the 'Space Baron' machines that you see around. They are available from Northern helicopter Products.

Specification

Product:	Kalt 'Enforcer ZR'
Manufacturer:	Kalt Denshi Kogyo, Tokyo, Japan.
Importer (USA):	Horizon Hobby Distributors, 4105 Fieldstone Road, Champaign, IL 61821, USA. Tel: (217) 355-9511.
Main rotor diameter:	49.25 in. (1.25 m.)
Overall length:	42 in. (1.067 m.)
All-up weight (dry):	6 lb. 5.75 oz. (2.9 Kg.)
Main gear ratio:	9.75:1
Main to tail gear ratio:	1:4.9
Control requirements:	5 servos and a gyro
Power requirements:	'28' to '36' engine