G.M.P. COBRA KIT REVIEW

Playing with a Cobra, is a sure way of learning to fly and become aerobatic. Nigel Ashwood reports on this recent kit from the GMP hangar.

Introduction

During my visit to the 1984 Cranfield Model Symposium I spotted the GMP Cobra on the Model Land stand, Len Bliss who runs Model Land kindly let me have a very close look at this compact and attractive piece of machinery, so to cut a long story short I was very impressed. Therefore when Colin Cameron-Tough asked me to review this kit I didn't need any persuading at all.

The Kit

The model is advertised as fully aerobatic but also stable enough for the beginner. The engine size should be between .40cu in and .50cu in, the radio installation can be a 4 or 5 servo set up. The standard kit comes without autorotation costing £295 or with autorotation this pushes the price up to £320 (the latter is the version reviewed). The kit arrived in a small but stout and attractive box with all parts for each assembly stage neatly packed in sealed polythene bags. The Cobra has a high percentage of parts supplied by Hirobo some of them very up market such as ball-raced tail pitch change, metal main shaft bearing blocks, the new type swashplate (as used on the Hirobo 888), machined engine mount, new type split cooling shroud etc, etc. GMP produce their own side frames which are some 30mm lower in height making it easier to fit into scale fuselages if required. A 48 page instruction manual is supplied, plus a separate sheet for head assembly, also a 'photo sheet' showing various parts of the model is a welcome addition. The step by step instructions are very easy to follow, on each page a metric rule is printed to aid identification of screws etc, (no excuse for mistakes there). As I have always liked O.S. engines I decided to use the 50 FSRH, I was pleased to see the holes drilled in the mount and the tapered fan collet fit this motor exactly. Whilst on the subject of the engine, the fan/flywheel/clutch assembly has to be accurately aligned to prevent any vibration problems. The clutch is a one piece steel machined unit similar to that used on Schlüter helicopters. It also features a top cone start and the clutch bell and pinion assembly is supported on two shielded ball-races, a very robust unit indeed. The side frames must be assembled on a flat surface and care must be taken to make sure they are properly 'squared up'.

The cooling shroud shown in the instructions has been replaced with the new Hirobo unit, there is a supplementary diagram sheet for fitting this suggesting the use of two wooden blocks to position the front of the shroud, these are in my opinion unnecessary. By elongating its slot the bracket supplied can be used making shroud removal for engine access a far quicker operation. The fitting of the shroud is stated as Step 4 in the instructions, due to the design of this new unit it should be now fitted after Step 5A (engine fitment). After the engine is fitted with cooling shroud and main drive unit the next stage is the collective pitch mechanism assembly. The collective lever shaft runs in oilite bronze bushes, these can be replaced with flanged ballraces from the Hirobo range if these are found to wear. It is interesting to note that Loctite is recommended where the ball joints are bolted to the metal levers, but where they are bolted to the plastic bellcrank Cyano glue is used. The reason is not stated but in my experience Loctite attacks the plastic and makes it very brittle, I personally use Tamiya thread lock as this is absolutely safe on plastics. The landing gear is assembled next. It is of quite light construction but seems suitably robust in view of the model's light weight. Drilling the Skid clamps to take small self tapping screws to prevent the skids rotating with vibration is a worthwhile modification. Another little tip regarding undercarriages, if you fly off concrete the skids can be protected by short lengths of silicone rubber tubing positioned near the skid clamps.

Quality and longevity are features associated with Japanese engineering, the swashplate in this kit has both attributes. The unit which is now also supplied in the Hirobo 888 kit has a sealed ballrace, it seems to be purpose made for this application and has no perceptible play at all. The rubber boot that was a feature of the old swashplate has now been discarded, this will lessen the load imposed upon the collective pitch servo as when moving the swashplate upwards the boot was compressed against the washout unit.

Whilst watching someone competing in the FAI schedule at Woburn 1984 I witnessed the devastation of a model due to the blade pivot and blade grip bolts pulling their way through the blade root. I have always feared this happening to one of my models so I always use wooden root reinforcements with a large metal bush for the pivot bolt to pass through. This is a departure from the kit manufacturers recommendations of using thin glass cloth as reinforcement, their method works but mine is just a personal preference.

Whilst on the subject of rotor blades I could find no mention in the instructions of checking their centre of gravity. On a model running a head speed of 1500rpm or more I consider this important if you want a smooth vibrationless machine, this also applies to the tail rotor blades.

The design of the rotor head is probably one of the most important factors affecting a helicopter's performance. The head supplied in this kit is a well proven design that has been used on nearly all Hirobo's scale models plus pod and boom types such as the 707 and the new 555. It features blade holders each supported on the machined cast yoke by two journal ballraces and a ball bearing thrust race, the yoke incorporates a slight coning angle (the one shown in the instructions does not as it is the 808 type). The teeter bearings are needle rollers which are covered with plastic caps hopefully keeping the grease in and dirt out. The blade holders come ready assembled onto the yoke presumably this is a safety precaution, as I have mentioned before losing a rotor blade is not in the least bit desirable. The rest of the head's assembly goes together easily if you follow the instructions carefully. Just one point worth mentioning, here is my addition of weights in the form of two eight gauge wheel collets on each flybar adjacent to the paddles. These can be moved close to the head's centre if you want a sharper response but if used in their outermost position this gives a

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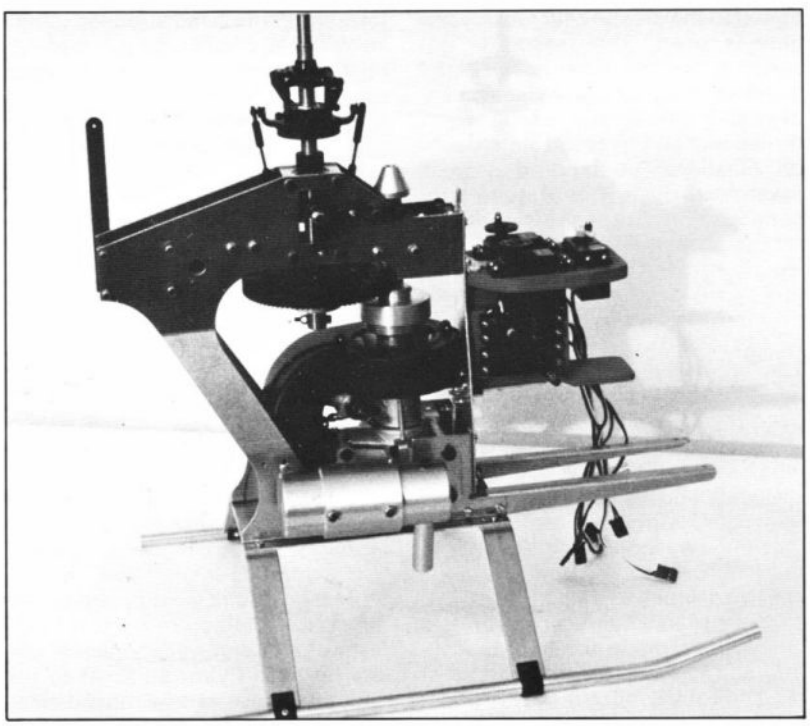
slightly more stable and solid control feel on the head.

Yet another Hirobo item is the tail rotor gearbox, this comes ready assembled and is filled with grease (I removed the cover to check it was greased – just in case). This just leaves the builder the hub and blade holder assembly plus the pitch change unit to assemble. The gear ratio between the main gear and tail bevel drive is 4 to 1 so this means the tail will run at 6000 rpm or more, so it is reassuring to see the use of a proper ball bearing thrust race as well as a journal ballrace in each tail blade holder. The twin ballraced tail pitch change plate has now been modified from the one shown in the instructions, the new type is easier to assemble and feels a much more precise unit than the previous type which relied on two collets to locate it on the 2mm push rod, The new one has a locking collar integral with the bush running through the ballraces. This modification has another advantage inasmuch as the tail pitch adjustment is now an easier operation.

The drive for the tail rotor is taken from a helical bevel gear on top of the main gear, this is coupled to the input shaft of the tail box via a 16 gauge piano wire shaft running in a brass tube which is supported by three wooden discs that should be siliconed or epoxied into the aluminium boom. The couplings each end of the piano wire drive use four grub screws each, these simply clamp on the wire. If you are like me and use the belts and bracers approach the couplings can be substituted for ones used by the Kalt range of helicopters, these use a crank in the wire to transmit the drive. In my view this is far better engineering practice. The wooden discs that support the brass tube in the boom were found to be oversize, so I bolted them together on a 3mm dia. bolt and mounted them in an electric drill, using a coarse file I turned them down until they became an easy slide fit in the boom. The instructions call for fitting of the boom and tail drive next, but I recommend this is left until later as with the boom attached the model is harder to manoeuvre on the bench. I left fitting the boom until after the radio gear was installed.

The wooden components in the kit are produced from lightweight ply and are die-cut reasonably well. The horizontal fin is produced from one of the two sheets of parts. This has two little fins at each end plus a piece to support the wire skid which has to be formed over the drawing supplied. This is one of the few faults found with the kit, at the specified length the skid would not be long enough to keep the tail rotors from striking the ground. To add the required extra 1 inch I used a longer wooden skid support cut from a spare piece of ply. The other sheet of ply parts make up into the servo mounts, the cutouts were almost perfectly suited to my Futaba S130 servos. Care should be taken at this stage to make sure the servos do not touch the woodwork anywhere else but the mounting grommets as nothing else ruins servos like vibration can. At the bottom of the servo mount I added a ⅛in play plate to act as a gyro mount, this I think is preferable to an aluminium bracket which can fatigue with vibration. The corner of the top servo platform has to be cut away to prevent it fouling the pushrod connecting the collective pitch servo to the pitch arm. To make installation easier I mounted the servos in position before attaching the mount to the helicopter, this saves juggling a few pounds of metalwork around whilst fiddling small woodscrews into place.



The main frame/mechanics as assembled. Fan housing is in two parts for easy access to engine/carb. Note robust wood servo trays.

Servo and swashplate linkages etc. are very easy to make up using the ready threaded and cut to length rods. A diagram illustrating each rod's application also gives an identification letter and also its length. The radius of each servo arm is also specified, this is the first kit I have come across that does this, a great help in setting up. The fit of the ball joints is without doubt the best I have ever come across.

One little complaint which is not restricted to just this kit is the lack of any retaining clip for the fuel tank, I decided to sit the tank on servo tape and use cable ties to strap it into place.

After fitting the boom, boom stays and tail rotor assembly the horizontal stabilizer is then attached to the boom using liquid silicone rubber. When I saw the original Cobra on display at the Cranfield Expo I expressed my concern about this method of attachment whereupon I was invited to try and pull the stabilizer off Len Bliss's model. After taking up the challenge I found that either I am not as strong as I thought I was or this method of attachment is entirely satisfactory.

Fitting the silencer proved to be a little awkward, the O.S. silencer needed a 90 degree adaptor, this fouled the sideframe and cooling shroud making fettling clearance with a router necessary. Care was taken to cover the engine's exhaust port with masking tape for obvious reasons. Liquid silicone was used between all silencer joints and was used as a locking medium on the bolts.

My choice of radio for this model was a Futaba PCM 8hp with five S130 servos and a Kraft Gyro. As the gyro draws its power from the receiver Nicad it is wise not to use the 500 MA pack supplied with this set but to use a 1200 MA pack. No problem was encountered finding space for the radio and gyro etc, but anyone using some of the tall servos which are available might find things a bit cramped.

The only item left at this stage for construction is the canopy. This transparent vac-formed moulding comes in two halves, the split line being in the vertical plane. Cutting out the two halves was quite easy as was the joining, Cyano was recommended for sticking the canopy together, this worked well but care is needed not to get any on the surfaces that are not to be painted as this will spoil the appearance of this attractive item. After masking the window area I sprayed the remainder with Black Baron epoxy paint, another method can be used such as painting on the inside with

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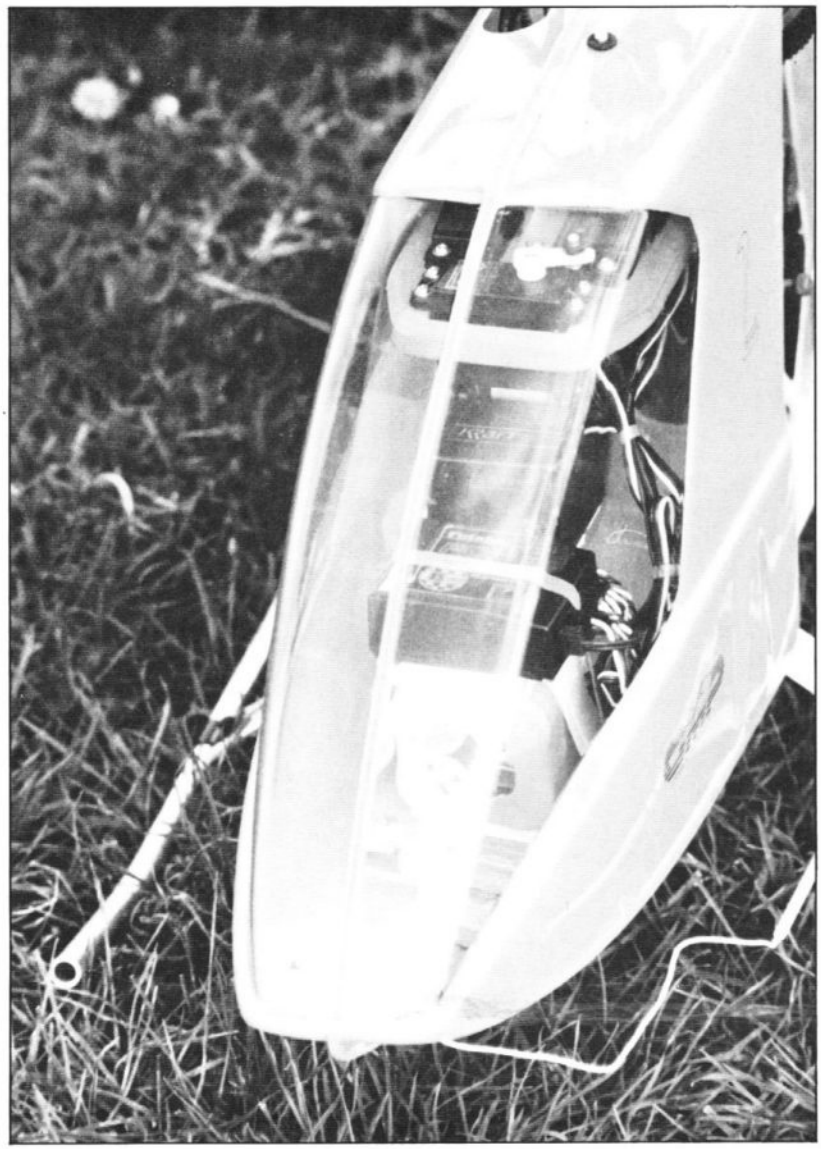

Looking through the very clear canopy with radio gear neatly and securely installed.

The reviewer with the completed model on a grey yet sunny day! It's like that in England – the weather that is.

one of the polycarbonate paints available. The finished canopy is then drilled and mounted leaving the final checking and lubrication of ball joints etc.

Flying

Now for the moment which for me is most enjoyable part of building a new model, the flight testing. After taking some photos a final check was made, all seemed well so the tank was filled and the engine was started, the idle mixture was adjusted until the tickover smoothed out and throttle response became instantaneous. When setting up the pitch of the main rotor blades I used a Schlüter pitch gauge. This seems to be an accurate method as only a half turn on one link was needed to adjust the tracking. The machine lifted off with nothing wildly out of trim needing just minor adjustments to the tail mixing and needle valve settings. The Cobra has a nice solid but responsive feel to the cyclic controls, the tail is one of the best I have encountered it's not twitchy but is very powerful, this is also probably due in part to the use of a Kraft gyro. The head speed was checked using an Optotach and was not far off the maker's recommended speed of 1500rpm, incidentally this translates into an engine speed of just under 13000rpm, the OS .50 seems very happy at these revs. After flying some circuits and trying out the descent a loss of head speed was noted indicating that more than the specified one to two degrees negative pitch was needed. So using the lower pitch trim on the radio I increased the amount of negative to three degrees, this seems to me to be the optimum setting for autorotations. As confidence in the machine built up some aerobatics were tried, loops and rolls were found to be easy with this agile machine. The Cobra if tamed down a little by fitting heavier paddles and running a lower head speed would make a reasonable trainer.

To sum up the GMP Cobra. It is a very well produced kit using good quality components throughout. John Gorham has taken well proven items from the Hirobo range and added his own ideas to make the Cobra a very practical but aerobatic machine. A Jet Ranger fuselage I am led to believe will soon be available for those of you who like aerobatic but scale type helicopters, I look forward to laying my hands on one of these in the near future.

Footnote from the Editor: Nigel brought the model round to me when he had completed it and I had a go at flying it. It was very stable and a bit more responsive than the Hirobo 555 (also reviewed in this issue). Both machines are quite easy for the beginner to build and learn to fly confidently. The Cobra with its high rpm makes it also ideal for aerobatics, the 555 ideal for learning autorotations.