

For those of us who have been involved in radio controlled helicopters for some time, it's a fair bet that we started with the MM 'Lark'. In my case I owned two of them and in those non giro days, struggled to hover and learn all the "do's" and "don'ts" associated with model helicopters. The 'Larks' were rarely left as the manufacturer intended by people like me and we modified, tinkered, improved (?), etc. in search of the better helicopter. I fitted a ball-raced head to mine, plus a 'Galaxy Models' cone start conversion that did away with the tiresome belt. All this pre-amble is by way of an excuse to justify the fact I'm still modifying and tinkering to improve the breed. Specifically this article is all about some changes I have made to my 1953 vintage 'Baron 20'. This superb little machine now has over 65 hours (or 264 flights) on it and is still going strong, so I must be doing something right.

For convenience, I've split the modifications into four sections; rotor head, engine/transmission, tail boom/tail rotor and miscellaneous.

## Rotor Head

The first thing you notice on any machine with a few hours on it, is the slop in the fly bar/see-saw assembly. This is caused by wear of the PTFE bushes which are fitted into the see-saw and the yoke. Replacing them only effects a short term cure. The proper solution which I have been flying for about twenty hours is a ball-race conversion (see photos). Four off 4 mm diameter ball-races (I used GMP Cobra parts, part no. 548) and a little machining work will produce a smooth slop free assembly. The only slight complication, necessitating the small additional pieces on my unit, is the fact that the flybar is not located centrally in the see-saw. Should anyone require help in this area please feel free to contact me via Model Helicopter World.

The Baron 20 as per the basic kit has a Hiller only control system and I quickly decided that I needed the improved response of a Bell/Hillier control system. Unfortunately this is quite an expensive update, but a much crisper cyclic response is the result. I haven't bothered with the white, lightweight paddles which are supposed to quicken

# IMPROVING THE BREED

John Bottomley does a little "Rolls Roycing" on his Baron 20.

the response also and similarly the spring plate is stock. I understand there are three thickness's available; 1.6 mm, 1.8 mm and 2 mm. Sometimes a 'nodding' problem can be cured by substituting a thicker plate. Another suggested modification for those brave enough to try inverted flying, is to fit a second spring plate underneath the original one. The feathering spindle bolt holes in the second plate should be opened up to clear the bolt heads attaching the spindles to the original plate. The second spring plate reduces the inverted coning angle and lessens the chance of a boom strike.

An area I have never had a problem is tracking of the main blades, possibly because I run the rotor head a little slower. However new main blade holders plus modified spindles are becoming available from Kalt and these incorporate a thrust race to take the centrifugal forces generated by the blades when the head is at operating rpm, this apparently leads to more consistent tracking.

The only areas of slop or play remaining on a B20 rotor head are the see-saw mixing arms. I have been trying to devise ball-raced levers to replace the original ones; but in the end I'll probably end up using TSK items which are available from

either 'miniature aircraft supply' or 'circus hobbies' in the USA!

Irrespective of which ever mixer is used in the collective pitch system, there is some play between the mixer guide screw and the sides of the slotted main shaft. This is simply cured; a small length ( $1/16$  inch to  $3/32$  inch long) of nylon snake inner fitted over the plain end of the guide screw will take up the excess clearance. This in turn translates into a slop free mixer assembly.

Commercial blade socks are available from several sources; However these can be simply and cheaply be made for a whole fleet of helicopters, using commercially available quilted material for £5 at the most. The basic configuration is sketched below:

All seams should be sewn with the material inside out and afterwards the sock is turned inside out again. Thus hiding the seam. The root end should be left undone for 2 to 3 inches along the trailing edge. Two strips of velcro can be sewn in and used to anchor the socks on the blades.

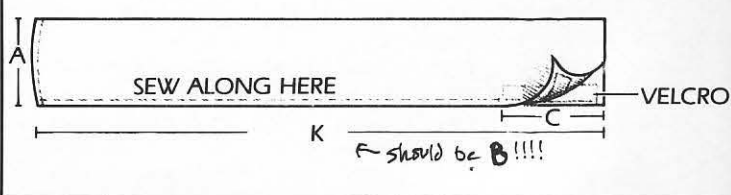
To facilitate transport of the helicopter in the family limousine, I fold the blades back and use a blade carrier (see sketch below). However most commercial blade carriers allow the blades to be angled downwards towards the tail boom. To achieve this, it is usually necessary to pop a ball link off say a blade pitch change arm. The danger here is that this same ball link will loosen and wear and may eventually pop off in the air with disastrous results! The design shown below allows the blades to be secured with all linkages in place.

## Engine/Transmission

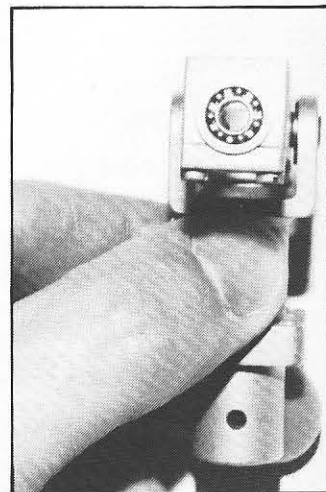
Much has been written about the original plastic clutch in the B20, however the only change I would recommend is to use epoxy to glue on the friction material to the clutch shoes rather than CA glue. No clutch, especially a plastic one, enjoys slipping at high idle rpm, so as soon as the engine has started,

FIG. 1

A =  $2\frac{1}{4}$  INCH B =  $19\frac{1}{2}$  INCH TO 20 INCH C =  $2\frac{1}{4}$  INCH



Below and right, Baron 20 ball race head conversion.



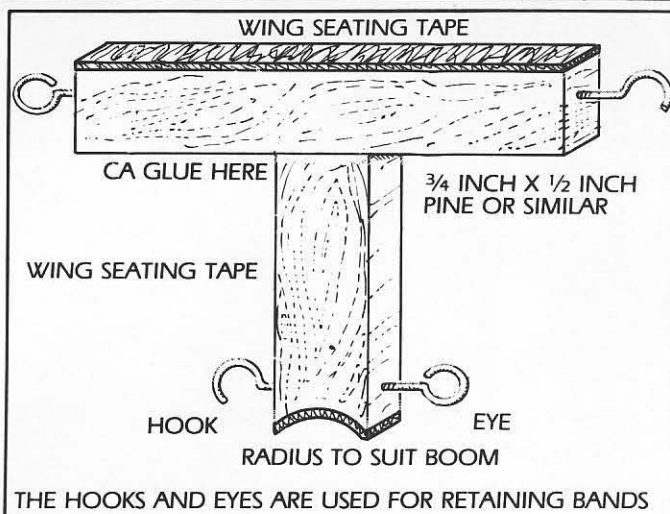
disconnect all the auxiliaries and move the helicopter to the take off area and allow the rotors to rotate freely. This will avoid heat build-up and localized melting of the plastic clutch — the most common failure.

My machine had a one piece clutch (same design as used by Schluter, GMP and others) made in aluminium; but a shoe broke off after only 5 hours. I made another in steel which is still serviceable some 50 hours later. During a recent major overhaul, I fitted the new Kalt 'MX' clutch which works superbly. It also incorporates a ball bearing rather than a bronze bush for location of the clutch shaft. I can supply a drawing of the solid steel clutch to those who are interested. Please send an sae via the editorial offices.

I quickly became exasperated with the belt start system on the Baron 20, so from a very early stage I fitted a cone start system. This was manufactured by 'Ishimasa' for use on the OS 21/25 FSR engines when fitted to their 'playboy' helicopter, slight modifications were required when fitting the unit to an OS 28H. I'm not sure if they are still available from the USA importer 'Condor Hobbies', California. Most certainly the new OS 32H with a factory fitted rear cone start will be ideal (see photo).

Another area of experimentation on the Baby Baron is silencers and quite frankly the standard aircraft silencer is too noisy. I have had success with three variations; a mini quiet pipe, originally designed for use on I/C cars; the muffler, which is supplied with the 'Shuttle'; and the 'Mac Heloball' (see photo). The 'Heloball' is one of the quietest, most compact designs available; it also causes minimal power loss. These mufflers are now available from ABC models in Worthing. A useful addition to the muffler is an extension to the outlet pipe; I use a 3 to 4 inch length of 1/2 inch diameter silicone tubing. This ensures that the exhaust gases exit the exhaust outlet into less turbulent air and are thus transported away by the slipstream. This causes negligible power loss and a much cleaner machine, especially for hovering and low level work.

The OS 28H in my Baron 20 has always sprayed a little raw fuel out of the carburettor. The



head and cylinder fins are now fairly well caked in burnt on residue. This problem will shortly be addressed by an application of 'Formula 3' from MD Models. I'm now using a replaceable element filter from 'Bruline Inc.' in the USA. The problem is that the fuel spray eventually clogs the filter, necessitating periodic removal and cleaning. A tedious job due to the one piece fan shroud. The obvious answer is to locate the carburettor outside the fan/shroud assembly; this is actually done on the special version of the OS 46 used in the 'Hirobo Stork'. Has anyone out there extended the carburettor venturi or moved the whole carburettor outside the cooling shroud (similar to techniques used on ducted fan models)?

## Tail Boom/Tail Rotor

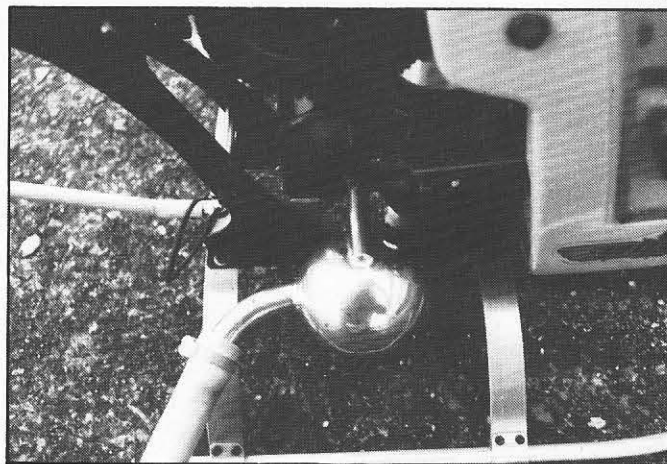
Shortly after I acquired my B20, I noticed that it had an aluminium tail boom and when after several arrivals it became necessary to replace it, I opted to use a modified MX boom rather than revert to the carbon fibre item. The procedure is as follows:

1. Parts required — MX tail boom, 1 set of fin/tailplane clamps to suit aluminium boom (NB, two varieties are available; for each type of boom). New T/R drive wire, 1 pair of MX tailboom clamps/mounts.

## 2. Fitting:

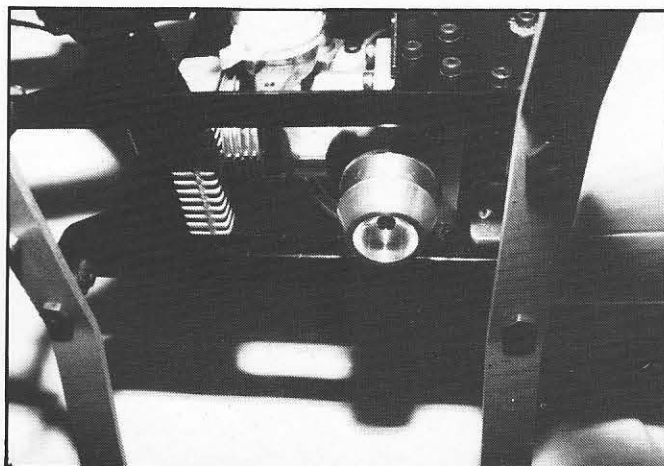
- a. Shorten tailboom to match overall length of original — cut material from sideframe end.
- b. Re-centralize drive wire bush and drill 1/16 inch diameter hole in 'top' of boom, immediately behind bush. This hole is for lubricating drive wire and bush to stop squeaking.
- c. Make up new drive wire as per original.
- d. Refit tailboom, T/R gearbox, etc. to helicopter.
- e. Refit fin and tailplane to tailboom. I have fitted the tailplane to the left hand side of the tailboom — it is then more convenient to hook the aerial wire to it.

My elderly B20 had wooden tailplane, fin and tailblades; and having used the pretty yellow plastic (or red) ones for a while, I believe that the wooden ones



Above, Mac 'Heloball' muffler.

Below, 'Shimasa' cone start conversion on an OS28H.

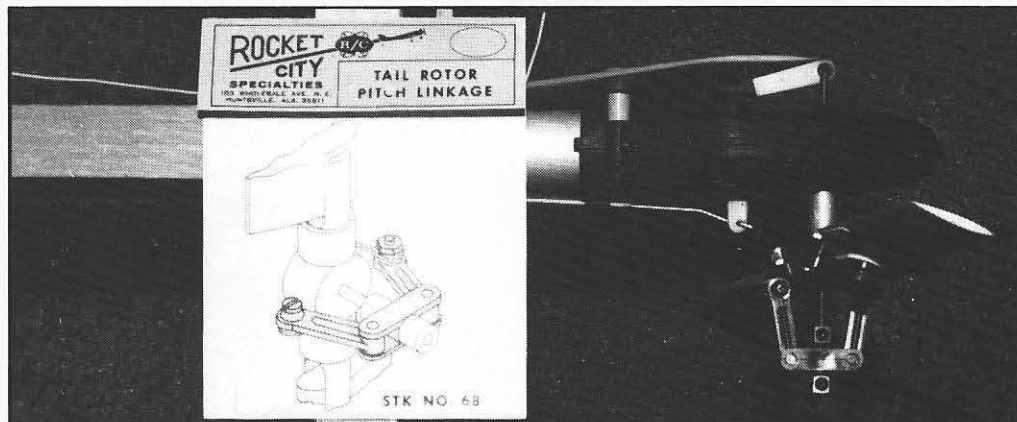


give more tailrotor authority. Also the wooden fin and tailplane are more durable than the injection moulded plastic variety. Several times the B20 thought it was a 'Sikorsky' and tried to angle its tailrotor. A simple cure for this was the fitting of a 'Jubilee' clip around the tailboom to adequately restrain the T/R assembly.

The only other problem I've had associated with the tailboom area was suspected radio interference on my trusty old 'Skyleader' gear. No amount of servicing or aerial re-routing affected a cure, so in desperation I made up earthing wires between the side frames and the boom steady and the tailboom. This cured the problem completely. Incidentally a tip when fitting the boom steady is not to bend the machined



# Upgrading the popular Baron 20



Above, Rocket City T/R linkage.

aluminium fittings, but bend the aluminium tube itself so that the sideframe end of the boom steady is horizontal at the point where it bolts onto the undercarriage.

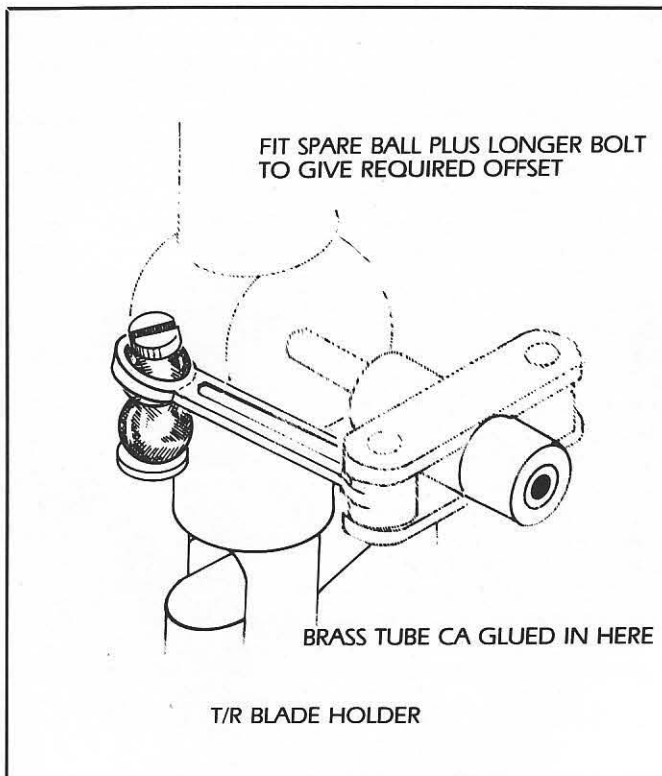
A cheap and easy way to improve the T/R linkage (see photo) is to fit a 'Rocket City' T/R pitch linkage — these are available from ABC models in Worthing. Since this is a universal linkage, a little work is necessary to fit it correctly to small machines such as the B20 and the Shuttle. The Ball-Links which are part of the linkage are not offset sufficiently — however this can easily be cured — see sketch below. Also the T/R pitch change shaft hole should be bashed using a suitable sized piece of brass tube.

## General

The B20 is a compact machine, therefore space inside the canopy is at a premium, particularly with 5 servos, RX, Gyro and battery pack. My solution to this was to have a special configuration battery pack made up to utilize space under the RX/Gyro platform (see sketch below).

I was also able to obtain 900 MAh nicads, which are almost the same size as 'AA' size nicads — but obviously they have extra capacity.

Another modification I was able to fit into my early B20 was a large fuel tank (150 cc?); I gather this is standard on later kits and on the 'MX'. My final tip is a fairly universal one; namely use a small self tapping screw to stop the undercarriage skids rotating. Usually this is fitted out of sight through one of the metal clamps which

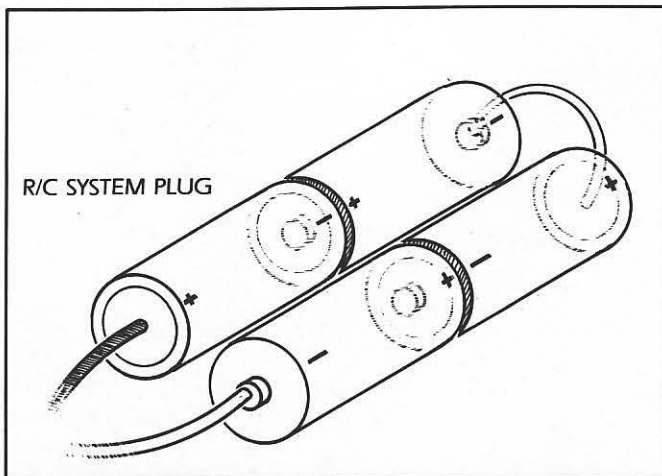


holds the skid to the undercarriage cross-member.

Well that's the end of my treatise on the Baron 20, none of which is intended as a criticism of the machine. However, any production machine can be

'improved' and altered and the above is a brief description of what has worked well for me.

With editorial sanction I'll produce details on my efforts on the 'Mk. 1 Shuttle' and the 'Champion'. □



## Names/Addresses Of Suppliers/Products Mentioned In This Article

**GALAXY MODELS.**  
160 Felixstowe Road,  
Ipswich  
Tel: (0473) 729279.  
(Cone Start Conversion for 'Lark')

**RADIO ACTIVE.**  
54 St. Mary's Lane,  
Upminster  
Tel: (04022) 50272  
(GMP 'Cobra' Part No. S48 (4 mm Ball Race))

**MINIATURE A/C SUPPLY.**  
2324 North Orange Blossom  
Trail,  
Orlando,  
Florida. 32804.  
Tel: (305) 4221531.  
(TSK Helicopter Accessories)

**CIRCUS HOBBIES.**  
3132S Highland Drive,  
Las Vegas,  
NV 89109.  
Tel: (702) 7320022.  
(TSK Helicopter Accessories)

**HELIIMPROVEMENTS.**  
c/o 5 New Walk,  
Shillington,  
Hitchin,  
Herts.  
Tel: (0462) 711893.  
(Ball Race Head Conversion.  
One Piece Steel Clutch)

**CONDOR HOBBIES.**  
17971 Sky Park Circle,  
Unit D,  
Irvine,  
CA. 92714.  
Tel: (714) 2501425.  
(Ishimasa Cone Start Conversion for OS 25/28H)

**ABC MODELS.**  
116 Chapel Road,  
Worthing.  
Tel: (0903) 34936.  
(Mac Heloball' Mufflers, 'Rocket City' Tail Rotor Linkage)

**MD PRODUCTS.**  
244A Colindeep Lane,  
London. NW9 6DE.  
Tel: (01) 200-0699.  
(Formula 3 Engine Cleaner)

**BRAULINE PRODUCTS.**  
PO Box 3786,  
Centre Line,  
Michigan. 48015.  
(Air Filters and Replacement Elements).