

Hands up all those whose 'Baron 20's' and 'Champions' are flying just that little bit better, or smoother, or possibly even more reliably? Judging by the response from the first two articles a number of the sports helicopter flyers out there want to improve their machines.

Following on from the first article on the Baby Baron I have now obtained, fitted, and test flown the TSK ball-raced seesaw mixer levers. The only bad news I have to report is that these arms are not generally available in the UK. However, they can be obtained (at a price!) from:

Circus Hobbies Inc.,
3132 S. Highland Drive,
Las Vegas,
Nevada, 89109-1042,
U.S.A.
Tel: 0101-702-732-0022

It is important to quote the correct part numbers otherwise the Circus Hobbies computer system will not recognise it! The correct item number is KTSKM-100, and the description is "Seesaw Mixer Lever 20". The price at the time of writing (Nov. 88) was \$34.99 plus \$5.00 shipping and handling in the USA. Quite obviously shipping outside the continental USA is extra. The best bet is to write or call using your favourite plastic money!

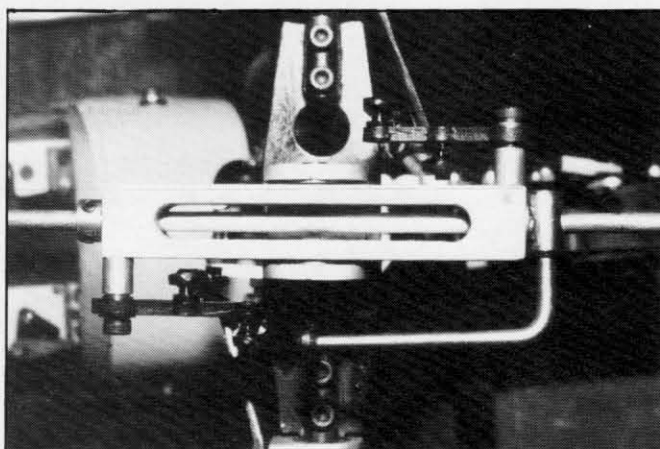
Fitting these ballraced mixer levers is simplicity itself. Firstly remove the existing standard mixing arms, and using the simple instruction sheet provided fit the ball raced arms. The only modification I implemented over and above the bits and pieces provided by TSK was to use longer bolts to attach the mixing arms and spacers to the see-saw. The threaded holes in the see-saw on my machine were a little slack, so I felt the extra security of longer bolts was in order.

Subsequent flight tests have shown up no significant differences in handling to the standard arms; however during crash tests carried out to provide an in depth review for you readers (!!), I have confirmed that there is definitely no tendency for the ball-links to come off during high load situations. In fact, a direct result of this is that the linkages themselves are more badly damaged (!) — tied in knots to be precise. The photos show the parts prior to fitting and also in situ on a ball raced B20 rotor head.

Improving the Breed

Handwritten notes around the title: "mutation", "the first of 50", "the 44 to the", "by taking the 44", "increase"

Our John takes a look at the Sport 500.



TSK mixing levers fitted to Baron 20 Rotor Head.

- 6) Engine mounting plate
- 7) Drive system.

Coincidentally, a colleague is in the process of evaluating a similar modification on his G.M.P. competitor. His machine is equipped with a zero coning angle 'pro head'. The claimed advantage of these aftermarket items is that there is less chance of the ball links popping off under extreme angular movements. More news anon.

Experience with the Sport 500

Moving on to the main point of this article — experiences with the popular M.F.A. Sport 500. One of the more interesting aspects of teaching tyro helicopter pilots, is the variety of machinery they have decided to enter the hobby with. Since the Sport 500 was first marketed, it has become popular, and rightly so. However, a number of areas seem to give problems to beginners, and these can be broadly categorised as follows:

- 1) Engine starting
- 2) Tail rotor control system
- 3) Rotor head/blade balance
- 4) Clutch shaft/clutch assembly
- 5) Engine handling

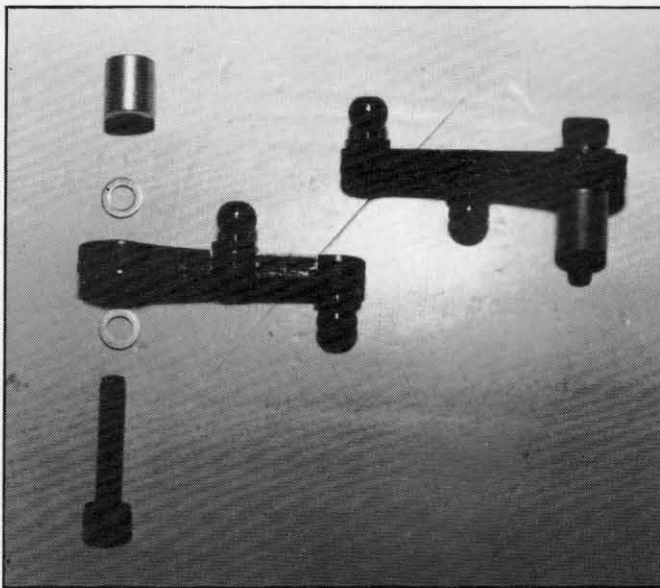
machines I have seen evidence of pliers or "Molegrips" to hold the pulley whilst tightening the crankshaft nut. A more drastic method, which should *never* be used, is to jam something into the engine exhaust, to prevent the engine from turning over. Ideally two 'Tommy Bar' holes should be added to the standard pulley; in this way the pulley can be held still whilst the crankshaft nut is tightened. In practice however this is not really feasible, because the best place for these holes is inside the groove of the pulley. Any sharp edges around the holes will damage the starting belt.

One solution, which has proven very successful, even in the hands of raw beginners is the 'no-load' starting system developed by 'Helimprovements'. The 'V' belt pulley is replaced by a two piece adaptor, (see photo) which incorporates 'Tommy Bar' holes to aid tightening. An associated problem, irrespective of which starting is used, is that of the threaded length of the engine crankshaft. If that length is insufficient, then the crankshaft nut will loosen fairly readily, thus loosening the 'V' belt pulley etc.

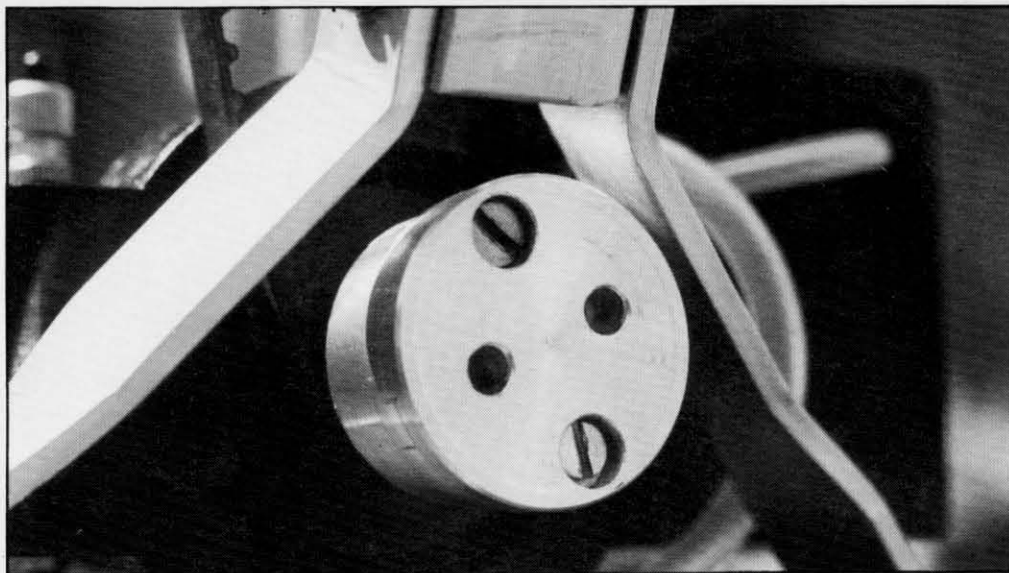
A popular engine for the Sport 500 is the Irvine Sport 40ABC; powerful, robust and reliable, with the added bonus of a replaceable prop stud. During the course of helping a number of beginners, the following method was developed, and which if followed precisely totally eliminates the problem.

- 1) Disassemble the whole fan/adaptor assembly from the engine.
- 2) Remove the prop nut from the prop stud.

TSK mixing levers for Baron 20.



- 3) Screw the prop stud *completely* into the engine crankshaft as far as it will go. Make a note of how much is 'used' in this way. Remove stud.
- 4) Screw prop nut onto stud, allowing two complete threads to protrude on the outboard side of nut.
- 5) Assemble adaptor backplate or 'V' belt pulley, plus cooling fan (depending on whether the standard starting system or the no-load system is being used) onto stud. Make a note of how much is 'used' this way also.
- 6) Add dimensions obtained in 3) and 5) together; this will give you the maximum length of stud required, which will be considerably longer than the one supplied!
- 7) Deduct 0.188" → 0.25" (4 → 5mm) from the dimension obtained in 6). This will now give you the ideal length of the stud.
- 8) Visit your local "Halfords", armed with prop nut and stud, and purchase a small pack of hexagon headed steel bolts, the same length or longer than the dimension obtained in 7). Note length required does not include the bolt head thickness!
- 9) If the bolts are longer, cut to length with a mini hacksaw, having first screwed the prop nut onto the bolt to a



'Helimprovements' No-Load starting adaptor fitted to MFA Sport 500.

of the radial holes provided. The 'V' belt pulley can be held in the same way if holes are drilled as described earlier; otherwise use the 'V' belt around the pulley, pulled tight like a noose to grip the pulley. Note also that a little non-permanent 'Loctite' may be used to advantage on the bolt thread. Tighten assembly as tight as you can.

Power Plants

Whilst on the subject of engines,

starting, etc., experience on the 'Sport 500' indicates that the engine should be run-in before fitting to the helicopter in the case of the Irvine 40 series of engines, the optional heat sink head is a worthwhile investment.

One of the best value for money engines on the market at the moment is the "Bluebird 46". This ABC engine has more than adequate power to fly a 'Sport 500' when equipped with all the extras such as gyro, additional battery pack, training gear, etc.

Tail Ends

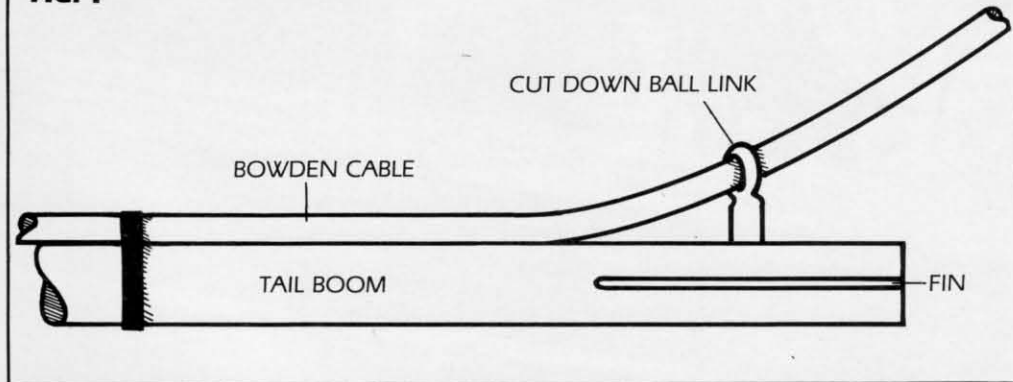
Another area worthy of attention is the tail rotor control cable

and its routing. All machines that I have test flown have suffered from a 'spongyness' in the tail control system. With a good gyro, the tail response is gentle even for a raw beginner, and could well be considered downright sluggish by us experts! (*Who does he mean? — J.D.*) One particular Sport 500 would occasionally slowly pirouette whilst sitting in a stable hover. This was eventually traced to flexing of the Bowden cable that is used for the tail rotor control system.

There are basically two methods that can be used to address the problem. Firstly it is important to support the outer sleeve of the Bowden cable. Two places in particular really do stiffen up the control run (see sketches).

These are, firstly in the area where the Bowden cable traverses the main frame, and secondly where the control cable leaves the tail boom to meet the tail rotor pitch change mechanism. A neat and simple support for the cable in the main frame area can be made from an old worn ball link (see Fig. 2). Cut the ball link in the area of the 'eye' so it can be fitted over the cable. Offer the threaded end of the ball link to

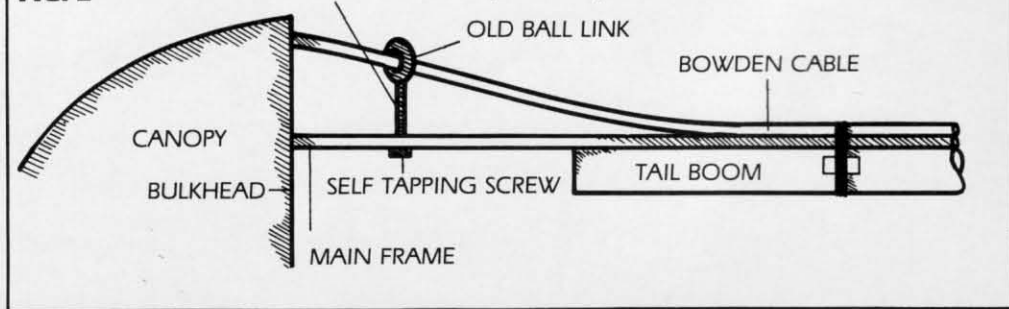
FIG. 1



position in-board of the length to be removed.

- 10) Clean up end of bolt with a file, and screw the nut off, thus remaking the threads in the region affected by the hacksaw.
- 11) Re-assemble fan and adaptor or 'V' belt pulley. Tighten using socket or box spanner over the head of bolt, whilst holding adaptor backplate with a "Tommy" bar in one

FIG. 2





Chris Handley's MFA Sport 500 — immaculately built — flies like a dream!

the main frame and mark with a 'magic marker'. Drill through the main frame to produce a clearance hole for a small self tapping screw. Deburr the hole, being careful to prevent debris getting into bearings, drive train, and engine carburettor. Finally using a small self tapping screw fix the support in place. To be really sure, a small amount of cyano glue can be used to permanently attach the ball link to the control cable. A similar solution can be used at the rear end of the control run (see Fig. 1). Alternatively a small wedge of balsa can be used to do the same job. The inner braided cable can be stiffened at either end (i.e. the portion which emerges from the outer sleeve) using solder, alternatively it can be replaced with a piece of appropriate diameter piano wire. The end result of all the above mods. is a much stiffer control run. My thanks to Chris Handley for helping develop these ideas.

Bearing-Up

For those of us that were brought up on the venerable Chart-Micro Mold 'Lark', the concept of 'fitting' the drive train bearing holders to the main frame will not be new. Several beginners have contrived to build up a Sport 500 with the drive train so tight that the system would hardly turn. Gradual disassembly often reveals the tight spots; i.e. loosening the bearing holders will often free up the drive train. A tip, often used to successfully cure a similar situation on the 'Lark' is to bed the bearing blocks down on a thin layer of 24 hr. epoxy such as "Araldite". Once the epoxy has hardened, the excess that has squeezed out can be cut away leaving a shim that will hold the bearing block in perfect alignment. Alternative ideas employed successfully by others include bending the main frame very slightly until the main shaft or whatever is running more freely; or removing small amounts of material from the bearing blocks by lightly sanding until the shaft remains

free running after the mounting bolts are tight.

Each to their own, the principle here is to ensure a drive train which is free running and thus absorbs the least amount of power. Another problem which results from built-in misalignment is high frequency vibration. This in turn leads to R/C equipment problems and mechanical unreliability of the helicopter; even the engine produces less power in these situations. Several beginners in my area have in fact suffered from engine mounting plate cracking. Once this occurs, the best bet is to replace the damaged item; but modellers are a tight lot and it is possible to 'save' a component by drilling a pilot hole at the ends of the crack. Other measures which can be taken include radiussing the cut-out area in the engine mounting plate, and drilling additional mounting holes to more

securely attach the plate to the main frame.

Fuel foaming seems to occur from time to time, even on smooth running machines. Once again we can draw upon experience with, say, the GMP 'Cricket', which uses a simple platform, upon which the fuel tank rests. The tank is isolated from vibration by some pieces of wing seating tape and held onto the platform by the humble elastic band. Finally, on the balancing front all of the Sport 500's have benefitted from rotor head and rotor blade balancing. In general the main and tail rotor blades have been very close right out of the box, however the rotor head design is a little asymmetric and certainly responds well to balancing. I would refer newer readers to my article on balancing in issue No. 1 of M.H.W.

Feedback

Many of you out there have developed modifications and improvements for your machines; if you would like other modellers to benefit from your ideas please feel free to drop me a line via the editorial offices or 'Helimprovements'. Once in a while we can then publish a review of these modifications etc., so that new readers can catch up. I would like to stress that these modifications and improvements are not intended to imply any problems or deficiencies with the standard machines.

Suppliers mentioned in this article:

1. Model Flight Accessories, Worth, Deal, Kent.
Tel. 0304 612132
Manufacturer of Sport 500
2. Helimprovements, c/o 5 New Walk, Shillington, Hitchin, Herts. SG5 2LN
Tel: 0462-711893/0473-328418
Balancing Systems, No-Load Starting Systems, etc.
3. Irvine Engines Ltd., Unit 2, Brunswick Ind. Park, Brunswick Way, New Southgate, London, N11 1JL
Manufacturers of the Irvine Sport 40ABC, etc.
4. MacGregor Industries Ltd., Canal Estate, Langley, Berks. SL3 6ER
Tel. 0753 49111/42251
Importers of the Bluebird line of Engines.

End of the day shot: Chris and Sport 500 and training U/C gear.

