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MORLEY HELICOPTERS HUGHES 300 (MK 3)

My particular Morley Hughes was purchased from the early production batch issued in Nov 82. I had first seen the prototype fly back in Mar 82 and was immediately struck by its realistic flying characteristics. I intended to fit the machine with a 3 blade head, to enhance its scale qualities. The point of this article, however, is to comment on the basic 2 blade head machine.

The model goes together easily, although the early set of instructions were rather too brief for a beginner. As I built it I became more impressed by the simplicity of the design. The mechanical layout is unlike any of the foreign kits, which says much for Jim Morley's original concepts. I was not surprised to find that he is an engineering design consultant by profession.

ENGINE

The model is designed for 40 cu in motors. Mine is fitted with an IRVINE 40 which gives more than adequate power. I have seen one very smooth, fast model powered by the latest OS 28, whilst at the other end of the scale I have test flown a machine powered by an OS 50. This was rather over-doing it, but does prove it can be done. Engine bearer spacing can be altered by elongating the holes in the plastic cross struts which support the engine bearer mouldings. Some modellers criticise the amount of plastic in the design, well I can assure them that it detracts nothing from the structural integrity of the machine and results in a strong, light model (6-lbs AUW). Once fitted, the engine is not easily removed so it is wise to run in and set up the idle on a new motor before fitting. The access hole for the glow plug is aligned to suit the OS 40, so those using other engines should elongate the hole as necessary. My model has the glow plug wired to an external jack socket to enable more scale features to be fitted to the cockpit.

The engine is so placed as to allow the fitting of conventional aircraft silencers. I would recommend, however, that a second expansion chamber is also fitted since the ordinary silencers never seem effective. I am using a Nick Reeves scale add on scale silencer (slim type). This is fitted at right angles to the conventional silencer and directs the exhaust downwards. If this cannot be managed at least use some of Jim Morley's flexible ali tube to route the exhaust residue away from the model.

TRANSMISSION

Power is transmitted from the engine to the rotors via a tooth belt and pulleys (14:32 teeth). As with other Morley machines the clutch is fitted to the 2nd pulley and is therefore separated from the engine. The clutch shoes are threaded onto 4 mm pivot bolt. They are easier to fit than other designs and are very smooth in operation. The main gearbox gives 4:1 ratio through the bevel and crown gears giving a total reduction of approximately 9:1 at the main rotor. A connecting tube joins the main rotor shaft to the output shaft of the gearbox. I attempted to fit a freewheel clutch at this point but gave up when I had difficulty arranging the control rods around the freewheel unit. My other problem was dismantling the freewheel to make it lock in an anti-clockwise direction. Some modellers brought up on clockwise rotation rotors seem to place too much importance on this feature of Morley machines. This was my first reverse rotation model and I did not find it difficult to convert. In fact I find approaches are easier as the yaw stick needs to be deflected to the right. The top main shaft bearing is an oilite plain bearing. It's a shame that a ball race could not have been used at this point, but it would have required a very cumbersome support moulding. It would also have increased the price of the machine by at least £2.50. Replacement oilite bearings only cost about 30p.

TAIL ROTOR

The tail rotor drive is via conventional piano wire connected to the gearboxes at each end by superb hexagonal sliding studding type UJs. The tail rotor itself is conventional and similar to the one used on earlier Morley helicopters except that the pitch axes are now fitted with ball bearing. A neat feature of the tail rotor control is the way it has been designed to fit inside the tail boom this improves the scale appearance of the machine.

CONTROLS

Of all the areas of construction the control layout was the most time consuming. The ff model is fitted with collective pitch. All the cyclic bellcranks are fitted to a common yoke which when raised and lowered becomes the collective pitch. The servo layout is straight forward but the servo supports are a little difficult to fit. I ended up bolting mine to the chassis. The 2 cyclic servo outputs should be aligned to the collective yoke pivot point to minimise cyclic/collective interaction at the

swashplate. The plan gives plenty of pictures and diagrams showing the control layout. I found a collective range of about 7mm at the swashplate was adequate. The swashplate has an interesting feature for those who wish to fit a 3 blade head in that the output ball positions are moulded into the rotating plate. The drag link on this design is very neat. The collective servo is also used to operate the throttle, a sensible feature since a fifth servo is not required for machines not fitted with autorotation freewheels. There is however, room for a fifth servo if preferred. A useful modification is to add a ½" long tube spacer to the ball output on the throttle arm. This helps to line up the servo output and the throttle arm. Alignment on the tail control push rod can also be improved by introducing an 180° lever arm fitted to the rear of the chassis plate.

ROTOR HEAD

The rotor head is of the AT (Advanced Technology) design and is the same as that fitted to the latest Morley Mk 2CS. It is a pure Hiller control system which despite the lack of Bell mixing is very responsive. The head is fitted with teeter rubbers which can be adjusted for tension by tightening the clamp bolts. I prefer to fly with fairly slack teeter rubbers. The head does have a tendency to oscillate in a nodding motion if driven at too low RPM or if the rubbers are too tight. An optimum head speed in the hover is 1,100 RPM approx. The blades require at least 5° positive pitch in the hover as they are comparatively short.

PLASTIC MOULDINGS

The model is based around a number of plastic mouldings. I have already said these add considerably to the strength of the machine. I can vouch for that having been surprised at the lack of damage to Jim Morley's machine after a flame-out at 40 ft. Repairs are also cheap because of low cost spares. Most of the plastic tubes are based on cheap commercial mouldings. The canopy is a simple but an effective set up. It is easily removed for inspection of the transmission. The model is designed so s that the ply cockpit floor is permanently fitted to the canopy mouldings. Those who wish to apply a scale layout are advised to fit the ply floor to the chassis by means of angle brackets so that it remains attached to the chassis when the canopy is removed.

The ply plate can then be used to carry receiver and batteries without having to unplug them each time.

The fuel tank is correctly placed on the C of G. It is fastened to the engine beavers by elastic bands. It is very prone to foaming so I recommend the fitting of some padding to the bearers and the use of very light plastic bands. The fuel tank is very visible which hopefully will prevent crashes due to lack of fuel. It also gives a good indication of the level of vibration on the machine. The model is fitted with scale fuel tanks which can be used to hide features such as gyros fitted to the rear chassis plate. The scale fuel tank mouldings are very prone to vibration damage and are improved by the addition of a strip joining the tank and canopy bolt mouldings. Jim Hadley is aware of this shortcoming and intends to produce a strengthened moulding.

FLYING

The machine is a delight to fly but beginners are warned that like all small machines the tail rotor tends to be twitchy. This means it registers any change in torque or wind direction. The collective needs to be set up to achieve an almost constant speed head. I strongly recommend that beginners use a gyro. I would also advise reduced throw on the tail control until it is mastered. I fitted a gyro to a ply plate fixed between the 2 U/C cross struts on the right of the engine. This plate could also be used to support a separate collective pitch servo which could be linked directly to the collective yoke doing away with the cranks.

The boom on this model tends to register any in-flight vibration. I would advise the careful checking of the static tracking as well as dynamic tracking of the blades. Adjustment to the static tracking by bending the blade holders often cures vibration completely.

The standard model is very fast and manoeuvrable. It is very steady in the hover but is not easy to hold cross wind. Because the full size is quite a nippy little machine the model looks right in the air when flown at speed. Despite its size it must be one of the most realistic scale models in flight to appear to date.

~~I hope to follow this article with another on the building and flying of the 3 blade head.~~

JOHN BARROW