

'Copter Corner

**TONY BRAY describes some
"enlivening" modifications for the
experienced chopper pilot**



THE IDEAL beginner's model aircraft is inherently stable and has relatively slow response to control commands. As the pilot's skills increase he will need a model that is less stable and more responsive. The fixed wing pilot has a very large selection of kits and plans for models with characteristics to suit his particular ability or stage of progress. The rotary wing pilot, however, is not so fortunate, since the number of helicopter kits available is limited and, as most of the customers for these kits are beginners, the models are designed to be as stable as possible. Furthermore, very few constructors have the facilities to produce original models.

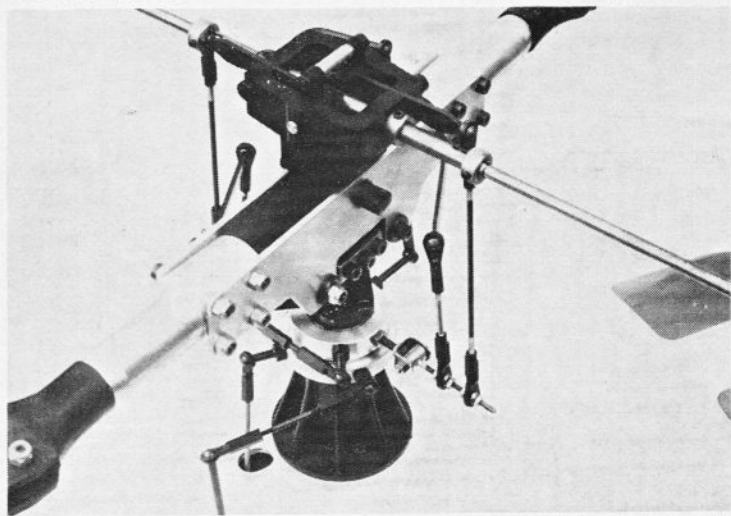
A number of modifications, however, can be safely made in order to change the characteristics of the available models.

There are four functions to consider: lift, yaw, lateral and longitudinal steering. The last two are, of course, produced by cyclic pitch control of the main rotor. If the model is fitted with collective pitch control, lift and sink response will no doubt be satisfactory. If, however, it has a fixed-pitch head, little can be done except to choose a motor with good throttling and set the fuel mixture to give the best response possible. Response to yaw commands can be controlled by changing tail rotor blade diameter and/or the pitch change rate. The problem here is that it has to be a compromise between the requirements for hover and forward flight, but, as the modifications are simple, it is easy to experiment.

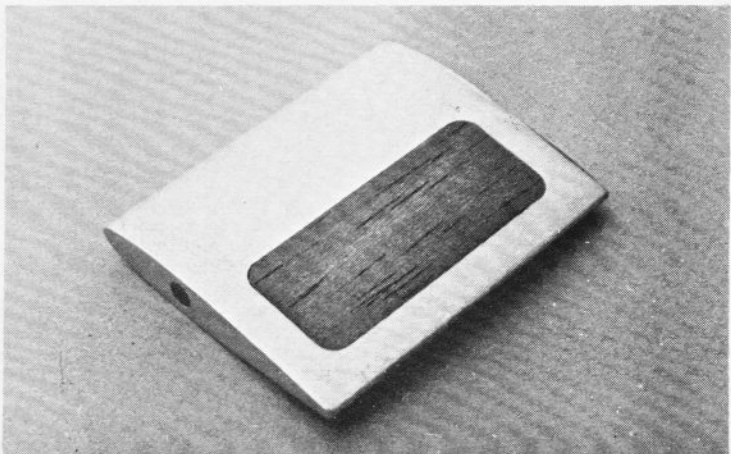
By far the most significant and, I have found, the most interesting changes can be made to the cyclic pitch control. All the kitted models, with the exception of the *Kavan Jet Ranger*, use the Hiller system. The *Jet Ranger* uses a mixture of Hiller and Bell systems. They all use servo paddles, however, and the response can be altered by changing the relative weight and area of these. In fact, Kavan offer larger, lighter paddles as an "Expert" extra. The

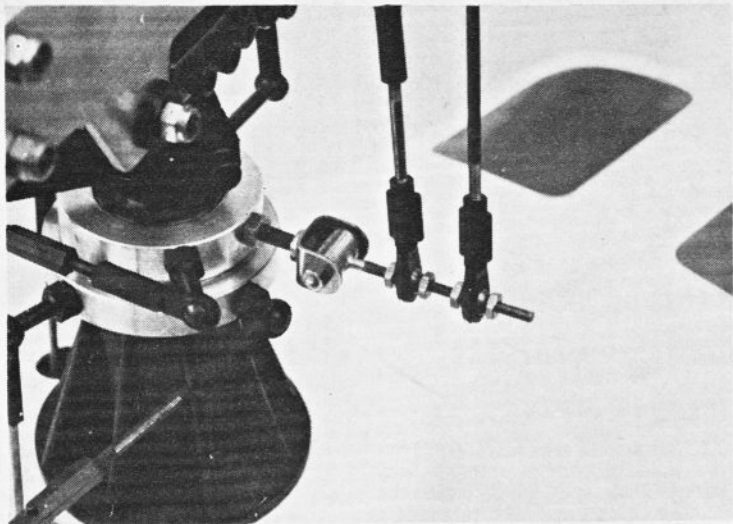
Schluter models are easily modified as the standard paddles are relatively heavy. They may be lightened by drilling or cutting rectangular holes which are then filled with light balsa. On the big Schluter models—*Cobra*, *D.S.22* and *Gazelle*—the original paddles weigh 55grms. Reducing this to 30grms. produces a really significant change in response, and paddles weighing only 20grms. have been used

successfully. The *Heli-Baby* may have the paddles lightened in a similar way but I have found it more successful to increase the area by using cut-down *Gazelle* components. The area may be increased by 50 per cent and the weight reduced to 30grms., which is the same as the small paddles fitted originally. To make the model ultra-responsive, the weight can be reduced to as low as 20grms.—but I



Above is a general view of the modifications Tony has made to the swashplate mechanics of his Bell 212—a close-up of the purpose-made mixer is shown overleaf, where the system is shown in diagrammatic form. Below: one of the lightened servo paddles described.





The small mechanical mixer device which Tony made can be clearly seen in this close-up shot of the swashplate assembly.

personally found the model too responsive, and very exhausting to control, when fitted with these.

The Graupner Bell 212 is already fitted with relatively large and light paddles, and there is little scope for

modification there. The head, however, is so constructed that it may be modified to the Bell-Hiller system used by Kavan. With this scheme, the cyclic-pitch change of the main rotor blades is produced by a combination

of two movements; first the actual tilt of the swashplate and, secondly, the tilt of the flybar. The ideal set-up will give the quick response of the direct-coupled system and the stability of a servo-paddle system.

I first saw this arrangement on a Bell 212 of the Swiss flier, Claude Betschen (holder of the world's distance record of 72.228 Km). He had the mixing lever fitted to the flybar linkage, but it can be fitted either to the blade pitch control arms or the swashplate. I have made the modification to the swashplate of my 212. Initially, the arms are of screwed rod but, once the optimum position of the balls has been established, will, in the interests of strength and appearance, be replaced with 2mm. diameter rods.

Finally, a word of caution. *Do not make mechanical modifications unless you have the facilities to produce a safe and soundly engineered job. Make and test only one modification at a time, so that its effect may be accurately assessed and evaluated.*

