
RM TEST REPORT

# Graupner's BELL 212

## — built and flown by TONY BRAY

GRAUPNER'S first contribution to the model helicopter scene is a near scale model of the Bell 212 Twin-Jet. The kits are imported and distributed by Ripmax, who have done so much to encourage model helicopter flying in this country.

The 212 is supplied in two packs —mechanics and airframe—and sets some new standards in quality for helicopter kits. Each pack has a comprehensive instruction book and a very detailed plan is included in the airframe kit.

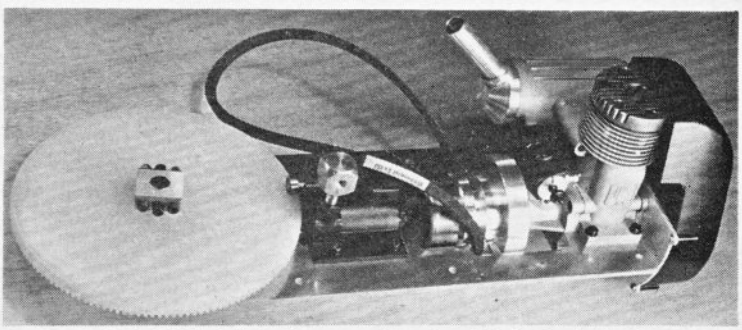
**Mechanics**

The mechanical kit is complete, *including engine*. The components are assembled into four main units: engine, clutch and reduction gear; swashplate and links; head with collective pitch control and blade holders; and tail rotor gearbox. The motor supplied is the H.B.61 Stamo, installed inverted. The crankcase cover and crank are modified to provide a rear drive for the cooling fan. This arrangement is very convenient as the glow plug is easy to reach and the carburettor is exposed for adjustment and priming.

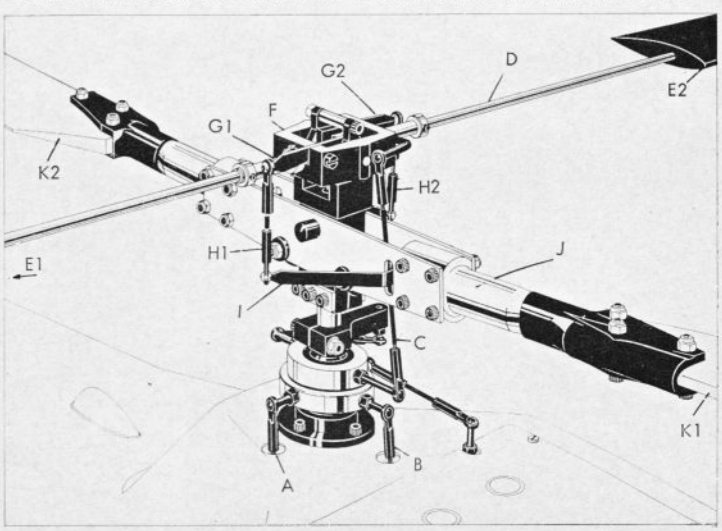
The crankshaft drives a substantial aluminium flywheel which is grooved for a 6mm. starting belt. This flywheel carries a two-leading-shoe centrifugal clutch driving a steel drum. The ratio between the engine and the main rotor is 9.928 : 1 and is provided by a single hypoid bevel reduction. The large wheel, 5½in. diameter, is moulded in nylon, and has 139 teeth, while the smaller wheel has 14 teeth.

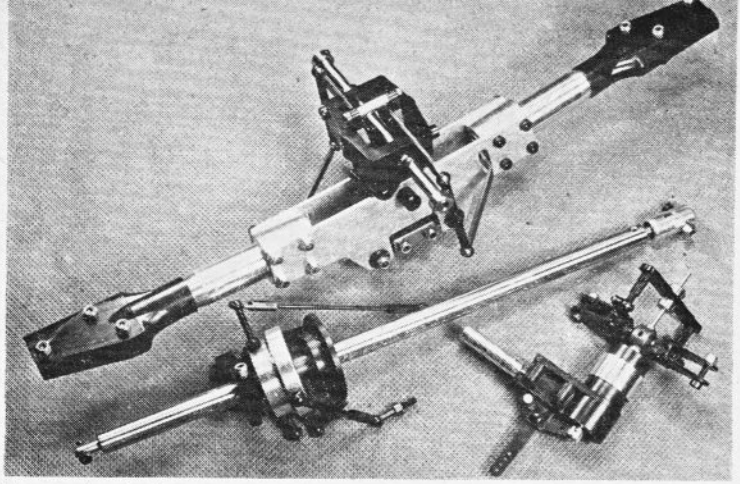
The tail rotor drive shaft, of 18g. steel wire, rotates at engine speed and a reduction of 2.5 : 1 is provided in the tail rotor gearbox. All the units rotate very freely and it is evident that very little power is lost in the transmission.

The main rotor head is of the Hiller type and closely follows the full-size design, with provision for collective as well as cyclic pitch control. Cyclic pitch change is required for horizontal control and is obtained by tilting the swashplate. Two servos, operating rods A and B (*see drawing*) provide tilt in all directions. This movement is transmitted by rod C to fly-bar D which carries paddles E1 and E2. When the angle of attack of E1 increases, E2 decreases and E1 lifts, E2 falls. This rocks frame F, which moves the centre points of levers G1 and G2. As the inner ends of these levers are fixed, the outer ends move —one up, one down. Rods H1 and H2 transmit this movement to arms I, fitted to the blade holders which are free to rotate in bearings J. This increases the angle of attack of one blade and reduces that of the other—thus one blade rises and the other falls. This movement is controlled cyclically by the swashplate, each blade having its maximum lift in the

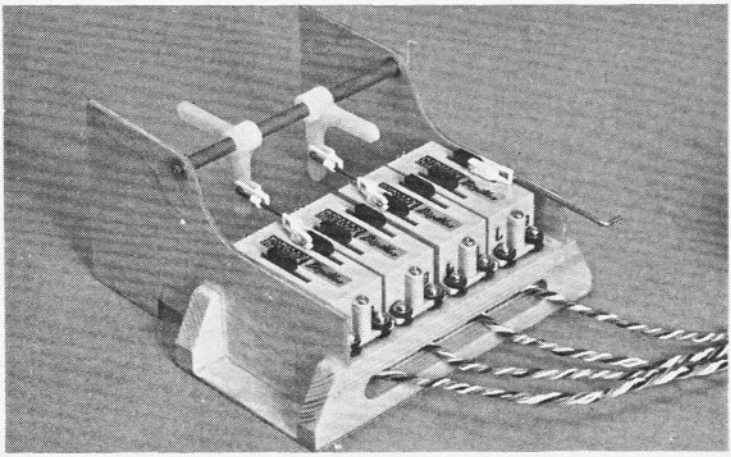


The mechanical kit includes engine, mounted on plate with clutch and reduction gear.





Above: main and tail rotor assemblies as they come in the kit. Below: in order to use Futuba servos, Tony made the servo box in two parts, the rear portion holding bellcranks and tail rotor pitch control tube is permanently fixed to fuselage, but front portion, holding servos, is removable.



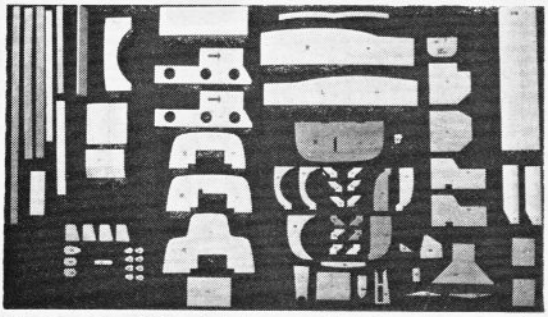
same position relative to the fuselage. This effectively tilts the disc described by the blades and provides a horizontal force for forwards, backwards or sideways control in addition to the lift required to support the aircraft.

Collective pitch control is used to increase or decrease the angle of attack of both blades, together, and this changes the lift generated by the blades. The way this control is obtained is as follows. A servo operates a rod through the centre of the tubular main rotor shaft, connected to the inner ends of levers G1 and G2. Lowering this rod raises links H1 and H2 and increases the angle of attack of both blades, increasing the lift. The servo controlling this movement is also used to operate the throttle, so an increase in revs. is accompanied by an increase in pitch.

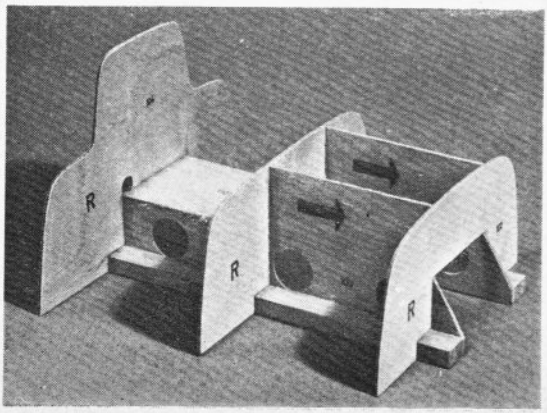
All the mechanical parts are well made and all screws and small hardware are of exceptional quality. The instruction book states that all bearings are lubricated for life but, as they are of an unshielded type, it is probable that they will need cleaning from time to time, after which lubrication will be necessary.

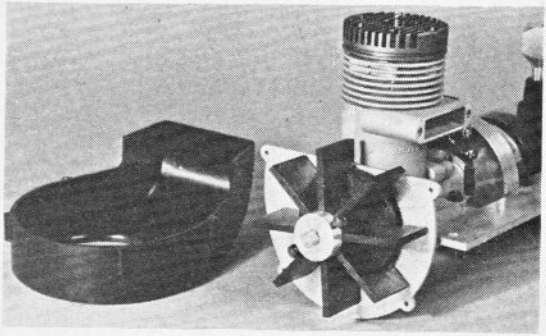
**Airframe**

The airframe kit is of typical Graupner high quality. The fuselage shell is particularly notable, being moulded from epoxy resin with a woven glass reinforcement. This produces a very even wall thickness, which is reinforced, where necessary,

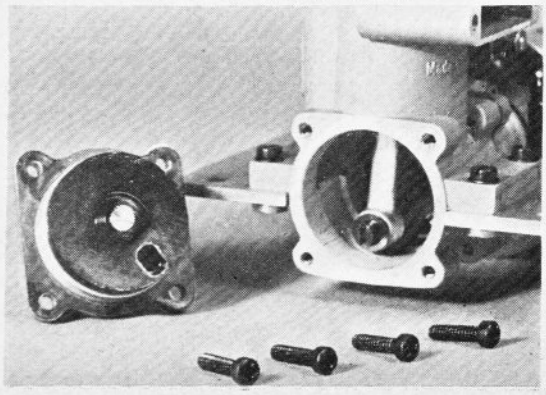


Wooden parts of kit and, below, assembled internal structure for fuselage.





Crankcase cover and crank of the HB61 Stamo are modified, as supplied, to provide rear drive for cooling fan.



with a second layer of glass cloth. The weight of this moulding is only 15½oz.! That it is also extremely accurate is evident when the woodwork is fitted, only a very minimum trimming of the die-cut parts being required. An adhesive called Enafest 300 is recommended for fixing the wood to the shell, which makes building rather slow, as it has a rather long drying time. Three types of adhesive are supplied in the kit, with clear instructions as to the use of each.

All the wood, cranks, links and rods necessary to fit the radio and servos are supplied, and are—naturally—designed for Graupner's Varioprop equipment. If different servos are used it may be necessary to modify the servo box, which also provides support for the collective pitch bellcrank and tail rotor pitch control tube. The photograph best illustrates how this box was constructed on our test model.

The main rotor blades, of symmetrical section, are supplied machined to shape, having four vertical laminations of hardwood for the leading edge and four balsa laminations for the trailing edge. This results in a very twist-resistant blade. The tail rotor blades, also ready machined, are balsa with a spruce spar, and of flat bottomed "Clark Y" type section.

**Building**

Finishing the fuselage presents no real problems. It is free from waviness and the mould lines are very smooth. Due to the glass being woven, however, the gel-coat may be sucked into the weave, which leaves a large number of pin holes in the surface. These are easily filled by brushing on a coat of primer filler, as I did, and, when dry, sanding back to the resin. I found this filled a large proportion of the holes first time.

Due to the small clearance between the rotor tips and the tail boom there is a danger of the blades damaging the fuselage in the event of a heavy landing. This danger is aggravated if the rotor is revolving relatively slowly. To lessen the possibility of such an accident, there is now available—as a separate pack—a long main shaft with an extended bearing. This raises the rotor head and increases the clearance by 1⅛in. and is a modification recommended for all but the most experienced fliers.

In view of its inverted installation, the motor was fitted with a 'hot' plug—both the hot Fireball and the Delmar Hotspot being found satisfactory.

Up and away!—Tony Bray gets the measure of the 212 within seconds. Below: "*Look—no hands!*"

**Flying**

The flying characteristics of the 212 are quite different from the helicopters previously tested. Collective pitch gives a degree and quality of control never before experienced. With the model hovering, it may be allowed to descend and then flared out, with instant response to the transmitter command. Also, because the rotor speed is high with low pitch, descents in strong winds, when translational lift is high, are very stable. Collective pitch control is a very real advantage. The model is also very responsive to longitudinal and lateral commands, probably due to the combination of very light servo paddles and the teetering head.

**Summary**

This model was a real pleasure to build. Its construction is relatively complicated and, at times, required considerable thought, but all the information is in the plan or the handbooks. All the materials and components are of very good quality and can be assembled without "bodging" or compromise. The kit is to be recommended—with one reservation. Due to the motor being inverted *it is essential to be particularly careful with its tuning and maintenance*, to obtain the absolute reliability so necessary with a model helicopter.

*Manufacturer:* Johannes Graupner, Kirkheim Teck, Germany.

*Importer:* Ripmax Models, Ripmax Corner, Green Street, Enfield, EN3 7SJ.

The 212 has a distinctively different shape—looks well in air and on ground.