



Bölkow's Bo105

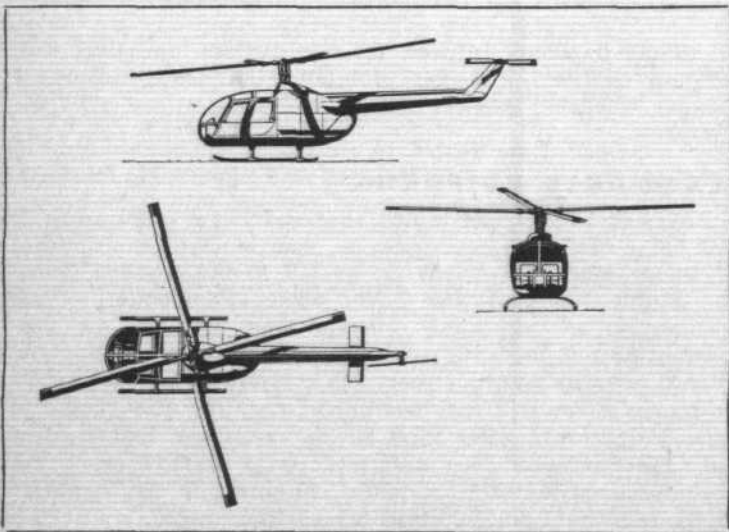
THE FIRST PUBLIC DEMONSTRATION of Bölkow's new light helicopter, the Bo105, was given recently at Ottobrunn, just outside Munich. This versatile, elegant little machine made its first flight on February 16 this year and since then it has accumulated 12 flying hours.

Apart from the fact that the Bo105 is the first helicopter of its weight class to have two engines, its chief feature is its use of the rigid rotor system developed by Bölkow, in conjunction with lightweight glass-fibre-reinforced plastic blades. Advantages of this system are manifold. The role of the hinges is taken over by the blades themselves, which are extremely flexible; the simpler rotor head creates minimum drag; and the rotor has a pronounced gyroscopic effect, thus assisting stability.

Accommodation consists of two front seats (with dual controls if desired) and a rear bench seat for two or three persons. There are four doors, plus a 53 cu ft luggage compartment.

The two engines are of a new type, designated MAN 6022, developed especially for this application by MAN-Turbo. The A3 version proposed for the production Bo105 will have a take-off rating of 375 h.p. The A2 version, now undergoing certification tests, will be fitted in the third and subsequent prototypes.

As it was considered inadvisable to test a new airframe, a new rotor system and a new engine all at once, the flight test programme was broken down into stages. For the first stage, that of airframe testing, a conventional rotor of the type used in the Westland Scout was fitted, and the engines were two Allison T63s (this machine, however, was in trouble with resonance during early ground runs and was destroyed). The second prototype—the one now flying—uses the Bölkow rigid rotor but still has the Allison engines. Finally, the third prototype, as already stated, will have the new MAN engines and



thus be a "proper" Bo105. Three more pre-production models are to be used in the test programme.

The aircraft has been under development at Bölkow for the past three years, though work on the hingeless rotor system had begun much earlier under a Ministry of Defence study contract. Progress has been rapid, thanks in part to the help provided by the French firm of Sud-Aviation, who had earlier become interested in the new rotor system and acquired a production licence. An Alouette II was modified to take a Bölkow rotor and has since tested the system throughout the performance range. An incidental result is that the Sud-Aviation SA.340 light observation helicopter to be built in conjunction with Britain under the recent Anglo-French helicopter agreements also uses the Bölkow rotor system, though in a three-blade version. Hence Westland is also interested in the system.

Although early work on the rotor was financed by defence funds, the Bo105 in its present form is a civil helicopter, suitable for all the tasks normally performed by a model of this size and weight. Total development costs are put at DM30 million (roughly £2,727,000) without those of the rotor system, which has cost another DM10 million (rather more than £900,000). The unit price of the production model, assuming a reasonable run of 200 to 250, is estimated at DM500,000 (£45,450). Sixty per cent of the development funds for the complete Bo105 have been provided by the Ministry of Economics, the remainder being found by the manufacturers.

As, however, this "remainder" still represents a tidy sum of money, Bölkow has split it with a number of other German companies, each of which has been responsible for specific parts of the programme. In addition to MAN-Turbo for the engine, these have been the Bölkow subsidiary Siebelwerke ATG (SIAT; construction of jigs and prototype airframes); Merkle Flugzeugwerke (tail rotor and general helicopter "know-how"—Bölkow, incidentally, has had a general co-operation agreement with this company since the beginning of 1965); Zahnradfabrik Friedrichshafen (design, construction and testing of gear system); and Feinmechanische Werke Mainz (hydraulic control system).

As already mentioned, the rotor blades are made of glass-fibre-reinforced plastic. The fine-spun resin-impregnated glass fibres—there are ten million of them in each blade—run lengthwise from the tip, round a loop at the root and back to the tip. The core of the blade is of plastic foam and the skin of glass-fibre fabric, the whole being baked hard in a curing oven. The leading edge then receives a reinforcement strip, approximately 2in wide to protect it from rain erosion. The de-icing problem proved easy to solve, since the Spraymat layer can be applied direct to the plastic surface.

Looking to the future, Bölkow naturally also hopes to be able to interest the Bundeswehr in this helicopter, though a military version would, of course, embody rather different features. Studies have also shown that the rigid rotor system can equally well be applied to larger and heavier models—up to, say, 22,500lb. Meanwhile, work is proceeding on a titanium rotor head which will be some 150lb lighter and run on elastomeric bearings which will require no maintenance.

Bölkow spokesmen at the demonstration stressed that the Bo105 is still very much in the experimental stage. Certification—initially for use by such operators as the Federal Frontier Guard or the Red Cross—is not expected until towards the end of next year, and first deliveries of production models from the SIAT factory at Donauwörth could hardly begin before mid-1969 at the earliest.

The flight demonstration, including hovering at about 15ft, a rapid transition to a steep oblique climb and several passes at quite a respectable speed, showed the Bo105 to have good manoeuvrability and to be distinctly less noisy than the average helicopter.

JOAN M. RIECK

BÖLKOW Bo105 (PRODUCTION MODEL)

Powerplant Two MAN 6022 A3 gas turbines, each of 375 h.p. (take-off) or 300 h.p. (continuous).

Dimensions Overall length (less rotor), 28ft; fuselage width, 4ft 11in; height, 9ft 6in; main rotor diameter, 32ft 2in; tail rotor diameter, 6ft 2½in.

Weights Empty, 2,355lb; max permissible gross weight, 4,400lb.

Performance Max speed, 135kt; max cruising, 120kt; rate of climb, 1,770ft/min (one engine), 255ft/min; Hovering ceiling with ground effect approx 19,000ft at take-off power, 13,775ft at continuous power; Hovering ceiling outside ground effect, 13,120ft (take-off), 6,560ft (continuous); service ceiling in forward flight, 19,680ft; range with full payload, 243nm.; endurance with auxiliary tanks, over 6hr.