THE INDUSTRY

Firth Cleveland Progress

IN his statement to shareholders of Firth Cleveland Ltd, issued in advance of the a.g.m. on July 20, Mr C. W. Hayward (chairman) reviews the work of the various companies that now form the group. Among those connected with the aviation industry are Simmonds Aerocessories, Firth Cleveland Instruments, Solartron Electronic Group and J. J. Habershon & Sons.

Points of interest from the report, concerning each of these four units, include: *Simmonds Aerocessories:* Orders increased by 57 per cent over 1958, the new South Wales factory is in full production, and hydrant fuel dispenser vehicles (manufactured under licence from the US Pryor Mfg Co) are expected to be increasingly used on Service and civil airfields. *Firth Cleveland Instruments* continue to supply contents gauges and electronic flowmeters for aircraft, marine and industrial applications, and new products are under development. *Solartron:* When the extension to the works at Farnborough, Hants, is completed at the end of the year the Solartron Group's UK factory space will exceed 250,000 sq ft. New all-electronic versions of the Solartron radar-training simulator have been sold at home and abroad, and the latest models of the precision analogue computer are in use in the aircraft and missile industry. *J. J. Habershon:* Output includes high-quality steel for the aircraft and other industries. The company's Sendzimir planetary mill for the hot rolling of stainless, high-carbon and mild-steel strip (one of the only five in the world) is capable of economically producing material of an exceptionally high quality, both dimensionally and in respect of surface finish.

Improved Dry Bearings

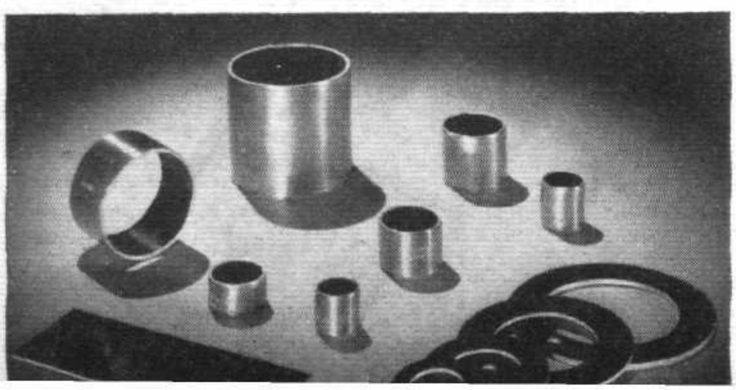
IN every modern aeroplane, and in nearly all guided weapons, there are many points at which there must be a bearing capable of carrying appreciable loads. It is naturally desirable to employ bearings requiring neither lubrication nor maintenance, but in the past this has usually entailed considerable compromise. In general, what has been needed is a true oil-free bearing material capable of withstanding considerable bearing pressure over a useful range of temperature and suffering from none of the many drawbacks which could render such a material almost valueless.

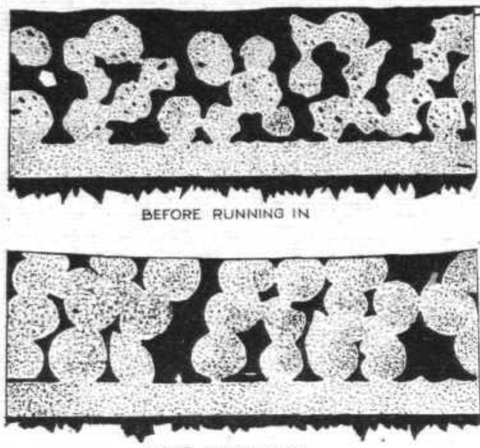
During the past few years the Glacier Metal Co Ltd, of Alperton, Middlesex, have progressively evolved what appears to be easily the best dry bearing material yet discovered. Essentially it comprises: a steel backing to provide structural strength; an interlayer, about 0.01in thick, formed from a pair of interlocked networks sintered from spheroidal bronze powder and impregnated throughout with a mixture of PTFE and lead; and an overlay of the PTFE/lead mixture, with a thickness of about 0.0008in, which rapidly deposits itself uniformly on the mating surface.

During the first few dozen hours of running the transfer of overlay material, and shedding of the excess, may result in a wear of perhaps 0.0004in; from this point onwards the mechanism of the bearing differs from that of a lubricated bearing in that attenuation of the PTFE/lead mix causes momentary metal-to-metal contact; the heat thus generated causes the bearing mix to expand, extrude from the bronze mesh, and immediately smear over the point of contact. Journal wear is not normally measurable; wear of the bush may be of the order of 0.00025in per thousand hours. Minimum compressive yield strength of the bearing material is about 20 tons/sq in. In most applications it is desirable to prevent fatigue failure by choosing a design limit of some 4 tons/sq in, but where relative movement should be slight much higher loadings are possible. In one application a single DU bush loaded at 18 tons/sq in carries the full weight of a large turbojet while it is being installed in the airframe or removed. Coefficient of friction normally lies between 0.10 and 0.16, but at lower speeds and under more intense loading the value falls to about half as much, and there is no stiction.

Indicative of the long life at high loadings which these Glacier bearings can achieve are the following figures for relative wear when running on a mild-steel shaft at a PV factor (lb/sq in multiplied by ft/min) of 16,000; when the rate of wear of DU is unity, other materials show the following figures: phenolic resin with MoS_2, 68; graphite/lead-bronze, 95; oil-impregnated porous bronze, 130; bearing-quality graphite, 208; woven asbestos impregnated with resin and MoS_2, 625; and nylon, 3,350.

Typical Glacier DU bushes and thrust washers





Initial and run-in structure of DU material (× 100)

All DU bearings are made as continuous strip, which is readily wrapped to form a bush or stamped out into thrust washers or hemispheres. Where more complex shapes are required Glacier have evolved DQ, a PTFE-filled homogeneous material which, although having poorer properties and performance than DU, can be moulded and machined.

Aeronautical applications of these bearings are too numerous to detail. The Avro 748, for example, has over 200, the majority relating to the flying-control surfaces and powerplant controls. Large numbers of DU bushes and thrust washers are employed in such aircraft as the Viscount, Comet, and Vanguard, the D.H.121 has DU bushes in the cable compensators and feel-spring struts on all three axes, and the largest of all DU bushes is a 10in unit specified for the main undercarriage strut of the VC10. The latest Rolls-Royce engines are full of DU or DQ items, and other applications include D.H. Propellers cold-air units and guided weapons and equipment by Aircraft Materials, Bristol Aircraft, Ekco, English Electric, Martin-Baker, Louis Newmark, Normalair, Teddington, and Teleflex. Glacier have licensees in France, Germany, Spain and the USA.

CIBA (A.R.L.) Changes

FOUNDER of Aero Research Ltd—now CIBA (A.R.L.) Ltd—Dr N. A. de Bruyne, MA, PhD, FInstP, FRAeS, is resigning from the managing directorship at the end of this year, though he will remain a member of the board. The company states that his resignation—at his own wish, as he wants to devote more time to research, particularly in the development of scientific instruments—has been "accepted with regret."

Dr de Bruyne

Mr Lea

Mr Hubbard

Educated at Lancing and Cambridge, Dr de Bruyne was in 1928 elected a Prize Fellow of Trinity College for his research work at the Cavendish Laboratory. In the following year he learned to fly, and his interest turned increasingly towards aircraft structures. He constructed and flew several machines; and in 1934, at his own expense, he built at Duxford a laboratory, hangar and landing ground. It was here that he established Aero Research Ltd and developed the Redux bonding process and various adhesives. The Swiss CIBA organization acquired control of the company in 1947, and its name was changed to CIBA (A.R.L.) in 1958.

On January 1 Mr R. F. G. Lea, OBE, MA, will become deputy chairman and, with Mr D. A. Hubbard, joint managing director. Mr Lea, who joined Aero Research in 1937 and was appointed to the board in 1946, served during the war with No 600 Sqn, RAuxAF, and was twice Mentioned in Despatches. Mr Hubbard joined the company in 1939 and the board in 1958. In charge of production throughout this period, he has been largely responsible for the planning of new urea-formaldehyde and epoxy resin plants.