HELICOPTER DEVELOPMENT IN FRANCE . .

reduced maintenance cost resulting from simplicity.

The line of attack chosen by S.N.C.A.S.O. is to have an engine or gas turbine driving a compressor in the fuselage. The compressed air is passed through the hub, which has rotating joints, and is then directed through the blades to combustion chambers located at the blade tips. The fuel fed at low pressure into the hub is then delivered by centrifugal force along the blades, to be atomized under very high pressure by the jets in the combustion chambers. It is ignited by a spark plug and the products of combustion are ejected through nozzles, so giving the propulsive force which drives the rotor.

This scheme of using a compressor has the advantage of burning less fuel than the alternative ramjets or pulsejets which have been developed in America. It has a further and very important advantage in that the drag of the small reaction units at the blade tips is negligible when they are not in operation. Any failure of the jets, therefore, does not interfere with the auto-rotational characteristics of the rotor, and the aircraft can land with complete safety, just like a gyroplane. In the case of ramjets and pulsejets the problem of satisfactory auto-rotation has not yet been solved owing to their high drag.

Mounted on a special or universal joint the hub is free to oscillate. It can therefore tilt so as to lie in the plane of rotation, so reducing to a minimum the displacement of the blades relative to the hub. This arrangement, plus the fact that the hub is not subjected to any torque, makes it possible to do without drag hinges with all the difficulties of bearings, dampers, etc., which they involve. The blades are attached to the hub by two leaf springs, located one on each side of the tubular spar extension, which serves at the same time as an air duct and a droop-stop. These springs provide the equivalent of flapping hinges, and their flexibility in torsion allows blade-pitch change by a conventional spider arrangement.

Blades are of composite wood and metal construction assembled by glueing, the hollow spar (which is of duralumin and of elliptical cross-section) being surrounded by hardwood with a balsa trailing edge. The whole is fabric-covered and enamelled.

Directional control by pedals operates two rudders, one on each side of the tail, whose hinge line is at 45 deg. The downwash from the rotor acting on these rudders gives adequate directional control when hovering.

S.O. 1100 ARIEL

This is the experimental machine commenced in 1946 and which made its first ground-running trials in 1947. Several flights were made during 1948 and in the spring of 1949 the final phase of testing was reached and has now been completed. The thermo-propulsive system is now working very well, and the aircraft has shown good manœuvrability and excellent stability characteristics. It is particularly free from the vibration to which all mechanically driven helicopters are subject.

A Mathis G.7 seven-cylinder radial developing 160 h.p. is fitted, and it drives a Turbomeca compressor through a step-up gearbox. The gross weight is 1,870 lb.

S.O. 1110 ARIEL II

This two-seater has an engine/compressor unit consisting of a Mathis G.8 vee-eight engine developing 200 h.p. and a Turbomeca compressor. It has the same rotor, 35.8 ft in diameter, as the S.O. 1100. Empty weight is 1,595 lb. As normal gross weight is 2,475 lb the useful load of 880 lb is thus 35.5 per cent of the gross weight. The estimated performance at a gross weight of 2,475 lb is: Maximum speed, 107 m.p.h.; vertical rate of ascent, 295 ft/min; hovering ceiling, 4,900 ft; cruising speed, 85 m.p.h.; best climb, 985 ft/min; normal cruising range, 156 miles. For a still-air cruising range of 62.5 miles the payload, including pilot, is 660 lb at normal take-off weight. This aircraft is now undergoing flight trials.

This year a three-seater version (the S.O. 1120) with a Turbomeca gas turbine/compressor unit will be completed. The ratio of useful load to gross weight will be increased to 57.5 per cent and the general performance will be higher than that of the S.O. 1110.

PROUD RECORD

THE author who sets out to write a book round a story of an industrial achievement, however great or historical that achievement may be, sets himself a formidable task, for unless he be a master of his art he may well find that he has produced little more than a glorified publicity brochure. Harold Nockolds, in the new, post-war edition of his classic history of Rolls-Royce,* has avoided all the pitfalls, and the result is a story that stands very firmly on its own merits.

Here we have, again, the fascinating story of the birth of the great firm, and of the building of its sturdy foundations by Henry Royce (who started his working life as a telegraph messenger), the Hon. C. S. Rolls (to meet his death, in the year 1910, in a flying accident), Claude Johnson, and a few dependable benchmen. There follow chapters which will have a nostalgic appeal to all who are old enough to remember motoring and "motors" in the days before the Kaiser's War; then comes the story of Royce's intensive work, in 1914, on the design of his first aircraft engine—in which he was assisted by A. G. Elliott and E. W. Hives, both of whom were destined to direct the fortunes of the great firm in later years. So successful were they in their planning, and so efficient the subsequent production effort, that R.-R. engines powered more than half the British aircraft used in 1914-18.

Equally interesting, both to motoring and aviation enthusiasts, is the story of the inter-war years, with the Schneider Trophy Races (for which the famous "R" engine, forebear of the Merlin, was designed) and land-speed records as high spots.

Few readers of *Flight* will need reminding of the contribution which the great Derby firm made to the Allies' winning of Hitler's War, but in these newest chapters of Mr. Nockolds' book the story is told in detail for the first time. The firm's part in the Battle of Britain is, perhaps, best summed-up in the words of Sir Archibald Sinclair, who was Air Minister at the time. Recalling those fateful days of 1940, he said, "I remember one night being called out of a meeting of the Defence Committee to be told that German bombers were approaching and that the radio beam which directed them was laid on a line which passed over Derby. We would far rather have heard that the beam was laid on Downing Street, or that parachutists were dropping in St. James's Park. For all our fighters in the Battle of Britain were powered by Rolls-Royce Merlin engines . . . ."

The book leads us on through the war years and so to the jet era; and the author ends with an unexpected but illuminating chapter on the company's finances. ". . . it might be deduced," he says, "that the directors . . . must have made vast fortunes, but such an assumption is not borne out by the facts." At his death, Sir Henry Royce left a sum much smaller than the estate of many a motor-car manufacturer whose products are now almost forgotten. On March 29th, 1949, Mr. Nockolds reminds us, £145,000 of the £1,150,000 issued capital was made up of "workers' stock," held by employees who are thus able to reap as they sow.

* *"The Magic of a Name," by Harold Nockolds. Illustrations from paintings by Roy Nockolds. G. T. Foulis and Co., Ltd., 7, Milford Lane, London, W.C.2. Price 25s.*

FAIREY APPRENTICES' SKILL

DURING the past year an impressive list of successes has been gained by members of the apprentice training scheme in the Hayes and Stockport factories of the Fairey Aviation Co., Ltd. Apprentices in these works obtained 38 Ordinary National certificates and 17 Higher National certificates in mechanical engineering. Four gained City and Guilds intermediate certificates in machine-shop engineering and three achieved their B.Sc.(Eng.). P. J. Bell (Hayes) obtained three distinctions and qualified for one of the Higher National certificate prizes awarded to the best 5 per cent of the H.N.C. candidates over the whole country.

Apprentices A. Blower and J. R. Wright (Stockport) were awarded three-year scholarships to the Northern University and to Manchester University Faculty of Technology respectively. Another Hayes apprentice, Denis Howe, a student of Southall Technical College, was awarded the Hele-Shaw prize and gold medal, the supreme award of the Council of the Institution of Mechanical Engineers. Mr. Howe was subsequently awarded an S.B.A.C. scholarship to the College of Aeronautics