



The Boeing Monomail of 1930. This, the mail version of the two built, was later converted to carry eight passengers.

low visibilities—a requirement of increasing importance as the aeroplane was gradually given the ability to fly safely *en route* in almost all types of weather.

Protracted flight on instruments became acceptable with the appearance of the artificial horizon and directional gyro in 1928. These instruments were developed by the Guggenheim Full Flight Laboratory at Mitchell Field, its work culminating in the first complete flight on instruments made by James H. Doolittle in a Consolidated NY-2 biplane elementary trainer on September 24, 1929. The two instruments, plus the vertical-speed indicator and the barometric scale-setting sensitive altimeter, began to be fitted in transport aircraft in the early 1930s. In conjunction with the greatly improved performance and handling characteristics of the new monoplanes they led to tremendous advances in all-weather flying capability. Another important factor was the better engine-out performance and handling of the new aircraft, which greatly reduced the hazards of engine failure when flying out of sight of the ground.

An increased amount of flying in clouds, however, brought a greater incidence of engine and airframe icing, and a spate of airline accidents to the new monoplanes from 1934 onwards drew attention to this danger. No fewer than 26 transport aircraft were, in fact, forced down by carburettor icing during 1934 in the United States alone. Rubber overshoe de-icing equipment accordingly appeared on the Boeing 247D and on subsequent types to combat airframe icing, and methods of heating the carburettor air intake were introduced.

The use of variable-pitch propellers on the Boeing 247 was an innovation of perhaps even greater significance than the advances in all-weather capability. This development, more than any other, made possible the great improvement in performance and, in particular, the wider speed range and greater operating heights of the

new monoplanes—the latter also being made possible by supercharged engines. The biplanes of previous generations had take-off, climbing and cruising speeds sufficiently close together for a fixed-pitch propeller to be reasonably efficient in all three regimes. This was no longer the case with the new designs. Now a fixed-pitch propeller designed to give satisfactory take-off was inefficient while cruising at height, and the aircraft therefore uneconomic; alternatively, if designed for good cruising performance, it gave unacceptably poor take-off. Variable pitch was the only way of achieving a wider range of operating speeds and heights and at the same time it increased the achieved efficiency of propellers in cruising flight by an average of something like five per cent.

The first workable variable-pitch propellers had been produced at the end of the 1914-18 war. At that time they were extremely heavy as well as being mechanically unsatisfactory. In the later 1920s, practical experimental variable-pitch propellers appeared and, in 1928, the British Hele-Shaw Beacham design was flown and proved to be satisfactory. This design was particularly notable because it had the important constant-speed feature which was to be adopted for Hamilton Standard and all other types in the late 1930s. The Hele-Shaw Beacham was, however, slightly before its time—only the advent of the faster monoplanes was to justify the weight and complexity of this development.

A few months after Boeings finalized their discussions with United about the original 247 project, the Douglas Company 1000 miles away in Los Angeles was reaching agreement with T.W.A. about the development of the DC-1. At this time, the fortunes of the Douglas Company were at a low ebb but their negotiations with T.W.A. were to set them on a path that was soon to establish them as the world's premier transport aircraft manufacturers.

(To be continued)

CANADIAN EQUIPMENT FOR HERCULES

ALL fifteen of the Lockheed RC-130 Hercules being supplied to the 1370th Air Photographic Group, U.S.A.F., are to be fitted with the Airborne Profile Recorder Mk 5 produced by Canadian Applied Research, Ltd., of Toronto. The order was placed after competitive evaluation at Wright Field.

The A.P.R. Mk 5 is a radar device weighing 176 lb which produces an accurate estimate of terrain height above sea-level at any altitude between 1,000ft and 35,000ft. It continuously records the barometric altitude of the aircraft while the radar measures the distance between aircraft and ground and traces a record of terrain height above sea-level. The system has proved accurate and saves a great deal of time and effort in establishing control points on the ground when mapping.

SPRAYING CHRISTMAS ISLAND

A STANDARD A.O.P. Mk 9 Auster, with its Army equipment removed and a 48-gallon tank installed in the rear cabin, has been used to spray D.D.T. on Christmas Island to counteract the multitudinous flies there. With a wind-driven pump and spray booms fitted, it was tested at Rearsby then flown out in dismantled form by a Hastings of R.A.F. Transport Command. The pilot and a fitter followed and operations began early this year.

The D.D.T., in powdered form, was mixed with jet fuel so that it could be sprayed; and it was found that because of the height of the palm trees, which caused the aircraft to fly at least 30ft above ground level, and the evaporation caused by heat, the

spraying could only be done with the largest available nozzles.

In 27 weeks subsequently, 30,000 gallons of D.D.T. were dispersed in 347 hours' flying. The work is to continue and additional aircraft have been ordered. It is thought that the flies on Christmas Island have been breeding faster through feeding on the remains of land crabs killed by the vehicles in use there.

RAPIDE AROUND AFRICA

AT the Royal Aero Club recently a cocktail party was given by Major and Mrs. "Freddy" Fox to celebrate their return from a year's tour in Africa. Maj. Fox is not a professional pilot—in fact, he was 52 when he learned to fly at Fair Oaks Aero Club. He conceived the idea of a long tour in a Rapide some years ago, and the idea reached fulfilment in 1957, when he and his wife set out with two small motor-cycles in the cabin of the Rapide, to see as much of Africa as they could in a year. The motor cycles were later sold, as the dirt roads rendered them impracticable, but Maj. and Mrs. Fox covered Africa from north to south; a few weeks ago a member of *Flight's* staff met them at Wadi Halfa on their way home.

The return from Egypt was not accomplished entirely without incident, as a sling worn by Maj. Fox at the party testified; the thick oil necessary for operation in Africa had resulted in a back-fire when he was hand-swinging the Rapide propellers at Naples. The African journey was finished by B.E.A.; G-ADYL—with 200 hours accumulated in Africa in its log-book—will be following on behind.