OBITUARY

Frank Whittle (1907–96)

AIR Commodore Sir Frank Whittle, British pioneer of the jet engine, died on 8 August in the United States, where he had lived for the past 20 years. As one of the first to link the idea of the gas turbine with the concept of jet propulsion, Whittle was unique in persevering and bringing his invention to fruition and into service. He stands alongside the most creative of British engineers, such as Watt, Stephenson and Parsons, whose names are linked with successive stages in the development of steam power. His simple single-shaft centrifugal turbojet was responsible for introducing the jet engine to the aviation industry virtually worldwide.

Whittle joined the Royal Air Force as a Boy Apprentice in 1923, and by the early 1930s he had become one of its top pilots. In 1934, the Air Ministry arranged for him to go to Cambridge University. In 1936, six years after he had patented the first jet engine, a small company was formed, Power Jets Ltd, with which he was associated until 1946. He retired from the RAF on health grounds in 1948, having reached the rank of Air Commodore. Between 1961 and 1970, Whittle was a consultant to Bristol Siddeley Engines and Rolls-Royce, and even at the age of 80 he was working on his own designs for supersonic aircraft.

He was a man of many parts; pilot, inventor and engineer. He was both a professional test pilot on seaplanes and a star turn at the prewar Hendon RAF displays. As an inventor, he filed his first jet engine patent in 1930, followed by many more covering a range of jet and other developments.

As an engineer, he was notable for the way in which he approached the jet engine and other technical developments from first principles — even before he had the benefit of an academic qualification. His eminent contemporary at Rolls-Royce, Dr Stanley Hooker, described Whittle as having an unrivalled grasp of the fundamentals of thermodynamics and aerodynamics, and that he had laid down the performance of the jet engine "with the precision of Newton", an achievement about which he was characteristically modest.

Whittle's approach differed from that of other jet engine inventors in Europe and the United States, such as Lysholm (Sweden) and Hobbs (United States). His emphasis was on simplicity of design, and in seeking to use the gas turbine where it was most efficient — at high speed at high altitude. His contemporaries in industry and government research establishments made the error of opting for complicated configurations in the pursuit of a performance competitive with that of the piston aero engine. None of these concepts proved successful.

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"There is no doubt that the aircraft gas turbine is going to have profound effects on future aircraft development. I predict that in from five to ten years' time we shall see the piston engine displaced in all new aircraft except the light aeroplane." F. Whittle, *Nature* **157**, 391–395 (1946).

The configuration chosen by Whittle was the single-shaft turbojet with single-stage centrifugal compressor and axial turbine. This arrangement became the hallmark of Whittle's work, and launched the jet engine industry around the world. The sole exception was in wartime Germany, where the more complicated but potentially more efficient axial compressor was adopted following the success of a centrifugal turbojet developed by Hans von Ohain at Heinkel. But all German work was prohibited by the Allies for a decade after the war, leaving the field clear for derivatives of Whittle's engines.

The historic year for Whittle was 1936. He graduated from Cambridge University with a first-class honours Mechanical Sciences Tripos; with the help of two ex-RAF colleagues, Power Jets Ltd was formed to develop his ideas; and British Thomson–Houston Co. Ltd was contracted to manufacture his WU (Whittle Unit) experimental engine, which first ran in April 1937.

From then on, Whittle had to struggle every step of the way against an uncooperative Air Ministry and Ministry of Aircraft Production. Even worse was the attitude of the Rover Co. Ltd, which had been selected to produce the W2B service engine. This, and the frustration of not receiving due recognition for his successes or support for his continuing efforts, steadily eroded Whittle's health. Official incompetence also contributed to the failure of the Whittle-powered Gloster Meteor fighter to be ready in time to have more than a passing involvement in the Second World War.

Although in 1946 he resigned from Power Jets a disappointed man, Whittle had achieved much in the decade since his first engine ran. During the war, details of his work had been passed to General Electric in the United States, where his centrifugal turbojet launched the US jet engine industry. At the same time in Britain, de Havilland developed its own version of the Whittle turbojet; and in 1943, Rolls-Royce took over the W2B programme from Rover, and started its own series of Whittle-derived engines.

Through these three companies, Whittle's ideas and technology spread worldwide. Whittle-derived engines were built not only in Britain and the United States, but also under licence in Australia, Belgium, Canada, France, Italy, Sweden and Switzerland. Significantly, Rolls-Royce also sold engines to the Soviet Union, where they were reverse-engineered and put into mass production. Later, they were licensed by the Soviets to Czechoslovakia, Poland and China. Something approaching 100,000 Whittle engines were built, powering a wide variety of combat, experimental and commercial aircraft. Few inventors have left so tangible a legacy.

Kenneth Fulton

Kenneth Fulton is at 3 Meadway, Berkhamsted, Hertfordshire HP4 2PL, UK, and is currently working on a biography of Whittle.