SUPER SPRITE

The First British Production-type A.T.O. Rocket Motor

IT was on April 1st, 1946, that Mr. A. V. Cleaver, who was until that date chief project engineer of the de Havilland Propeller Company, began a general study of rocket propulsion. At that time almost the only British rocket-development work was being carried out by the Ministry of Supply, largely at the R.P.E., Westcott, and at the R.A.E.; this Ministry was also formulating a specification for a liquid-oxygen motor which materialized as the Armstrong Siddeley Snarler (*Flight*, August 6th, 1954), and Faireys were also active in this field.

The de Havilland Enterprise—and the late Major Frank Halford, then chairman of the D.H. Engine Company, in particular—saw that great long-term benefits might be gained by getting into the rocket business. The first thing to do was to establish a nucleus of technicians, and Mr. Cleaver was therefore transferred to the Engine Company with the title of special projects engineer. Initially he was on his own, but Mr. W. N. Neat joined him as deputy on the first day of 1947.

The first tangible rocket experiment conducted by the D.H. Engine Company took place during 1946, when a pair of ex-German Walter 109-500 A.T.O. rocket motors were borrowed from Westcott and demonstrated with the Ghost-Lancastrian at Hatfield. These units were of the simple "cold" peroxide type, in which thrust is obtained by decomposing concentrated hydrogen peroxide into steam and oxygen, without combustion. The trial was carried out as a private venture, with the object of showing that rocket motors of this type could be handled and employed with ease and complete safety.

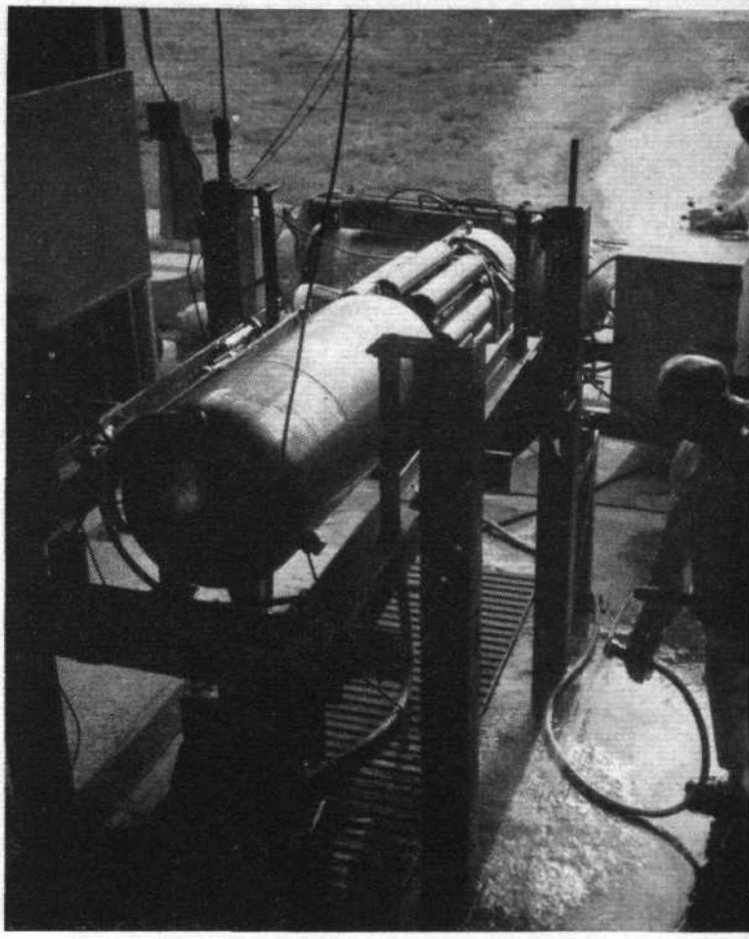
During 1947, the special projects department expanded and, about the middle of that year, the Ministry of Supply placed a contract for an A.T.O. motor for the D.H.106 (Comet) as an insurance against possible lack of thrust in that aircraft under adverse conditions. The de Havilland Engine Company were given a fairly free hand in the development of this motor, and it was agreed that it should be a "cold" peroxide motor, with high-test peroxide (H.T.P.) used as a mono-propellant and supplied to a reaction chamber by pressurizing the tank. Among the many advantages of such an arrangement was the possibility of rapidly achieving an exceptional standard of simplicity and safety.

The decomposition of the peroxide was promoted by injecting a liquid catalyst into the reaction chamber, where it could mix with the H.T.P. and cause spontaneous decomposition. The catalyst chosen was calcium permanganate injected as a strong solution, and it stained the efflux from the motor to a muddy brown colour. In view of later developments this seems a primitive arrangement, but it was already a well-tried method as a result of German work.

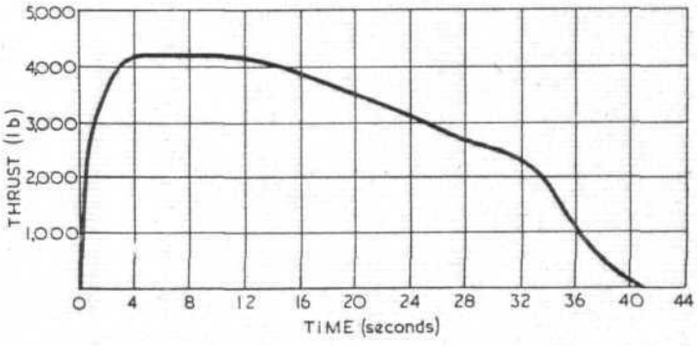
This motor was named the Sprite and a full description was published in our issue of February 2nd, 1950. The peroxide tank had a capacity of 39 gal, and the motor was so designed that this quantity was consumed in 16 sec, the maximum thrust being 5,000 lb and the total impulse 55,000 lb-sec. The Sprite first ran as a unit in November 1949. By 1951, a pair were mounted in G-ALVG, the prototype Comet (which was then two years old), and flight trials started in April of that year. Altogether, six Sprites were made, and these completed a total of over 500 firings. Flying trials were confined to tests in the Comet prototypes, the development of the motor being entirely sponsored by the M.o.S.

Altogether, the Sprite afforded an excellent opportunity for the embryo de Havilland rocket team to acquire essential experience. Although the eventual development of the Comet nullified the requirement for the Sprite, this motor was, therefore, of fundamental importance in laying the foundation for future developments.

According to traditional definition, a catalyst is a substance which promotes or assists a chemical reaction, but which does not take part in the reaction and itself remains unchanged. Clearly, injection of the catalyst, as was done in the Sprite, was not the optimum arrangement. Not only was the efflux tainted,



Washing-down after refuelling a Super Sprite with kerosine and high-test hydrogen peroxide in one of the test-beds at Hatfield last week.



Thrust plotted against time for typical Super Sprite operation.

Firing history of de Havilland A.T.O. motors:—

(A) first Sprite DSpr.1 firing, 24.11.49; (B) spec. cat. flight-approval DSpr.1, 2.3.51; (C) flight in Comet, 7.5.51; (D) first DSpr.2 firing, 7.6.51; (E) flight-approval DSpr.2, 11.9.51; (F) as "E" for DSpr.2 modified, 21.1.52; (G) first DSpr.3 firing, 30.1.53; (H) DSpr.2 flown in Comet, 22.4.52; (J) first Super Sprite DSpr.4 firing, 23.4.53; (K) DSpr.4 flight-approval, 14.8.53; (L) Type Approval DSpr.4 fixed installation, 22.9.54; (M) as "L" for jettisonable installation, 11.3.55.