

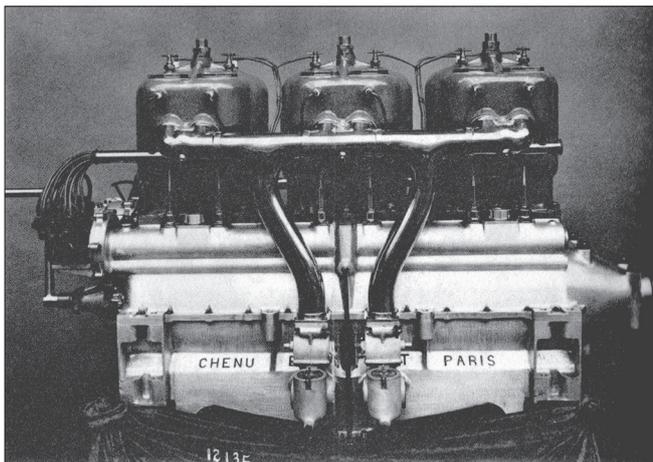
# FARNBOROUGH'S TAIL BOOM FIGHTERS

by Paul R. Hare

**A**LMOST FROM THE BEGINNING of British military aviation it was considered that at least some, but by no means all, aeroplanes would need to be armed, and initially designers generally assumed that this would require a separate crew member to load, aim and fire the gun. It was also generally assumed that in order to provide the widest possible field of fire the machine would need to be a pusher, with the gunner in the forward cockpit. Although machine guns may now have seemed the obvious choice, the idea of fitting some kind of cannon also had its advocates, with the designers at the Royal Aircraft Factory favouring that then being developed by the Coventry Ordnance Works and known therefore as the COW gun. As originally designed, this semi-automatic weapon fired a 37 x 94mm rimless shell weighing approximately one pound and, in order to minimise the shock to its mounting when fired, operated on the 'Long Recoil' system originally invented late in the nineteenth century in which the barrel and bolt remain locked together for the whole of their rearward travel, compressing the recoil spring which in the COW gun was wrapped around the barrel. At the end of its travel the barrel is forced forward by the spring, leaving the bolt behind held back while the spent cartridge case is ejected, the bolt then returning to chamber, and then fire a new round.

In order to carry this weapon, which at that time was itself still under development, the Royal Aircraft Factory conceived the Armed Experimental No.1 (AE1) design of which was in progress by the end of March 1912.<sup>1</sup> S.J. Waters was responsible for the design, assisted by Henry Folland who carried out load calculations, and detailed various components. Preliminary general arrangement drawings were completed by early August 1912, by which time the type's designation had been changed to FE3<sup>2</sup>, although the Factory was then still awaiting authority to begin construction, the type being listed in a memo<sup>3</sup> by Mervyn O'Gorman, Superintendent of the Royal Aircraft Factory, dated 19 August 1912 entitled 'Aeroplanes Under Consideration'. In this document it was described as: *Fighter - 75 Chenu - 2 seats - Gun.*

*A six-cylinder Chenu engine as fitted to the FE3. The pairing of the cylinders, although unusual in an aero-engine, was then fairly common practice in the car industry.* :via author



The six-cylinder, 75hp Chenu engine, manufactured in Paris, appears to have impressed O'Gorman, who planned to use it in several forthcoming projects including what later turned out as the FE4. One had already been purchased at a cost of £428<sup>4</sup> and, when an example was later exhibited at the Paris Air Show, it was described thus: *The cylinders, which are cast in pairs of cast iron, with the jacket cast integral with the body, are placed vertically on an aluminium crankcase. They have exceptionally large inlet and exhaust valves which are arranged on opposite sides of the engine, while ample water spaces are provided, reaching well down the cylinder barrel. The lubricating pump, driven off the centre of the camshaft is placed in a sump formed in the base of the crank chamber which contains sufficient oil for ten hours running without replenishment. Bosch double ignition is fitted, one plug in each cylinder being at the side nearest the inlet valve, and the other over the exhaust valve. This form of ignition would appear to be essential on these engines, which run at an extremely high speed, on account of the slow ignition of the charge due to the shape of the combustion chamber. Two carburettors are fitted to the two six-cylinder models, whilst the standard thrust bearing fitted permits the engine to be used for a tractor screw or a propeller.*<sup>5</sup>

The FE3 was a pusher and the engine was mounted inside the nacelle, forward of the cockpits, where cooling could be efficiently arranged without complicated plumbing, and as originally designed, the radiator was mounted on the upper surface of the nacelle, shaped to follow its contours. Drive to the propeller was by means of a horizontal shaft low down in the nacelle, with chain drive, encased in an oil bath, up to the four-blade propeller at the rear of the nacelle. Probably because the backlash potentially inherent in this arrangement was thought likely to make propeller swinging ineffective as a means of starting the engine, a car-type starting handle was designed.<sup>6</sup>

In order to reduce drag its tail surfaces were attached to a single, fairly small diameter tubular boom, supported by a mounting passing through the hollow propeller shaft, and braced by wires running to the wings, attached to the main spars at the position of the inboard set of interplane struts.

Otherwise the design was fairly conventional for the time, the preliminary drawings showing wings of equal span, similar in plan to those of the BE2a, and it is likely that, at this stage, the employment of standard BE components was

*This preliminary drawing of the FE3 shows the external radiator, and equal span wings, neither of which featured in the actual aeroplane, as well as the change of designation from AE1.* :RAF Drawing A1548

