

CORRESPONDENCE.

Sir,—May I supplement the historical facts mentioned with regard to tandem and co-axial counter-rotating airscrews as given by Mr. H. M. McCoy in his recent paper (June issue of the "Journal," p. 483-484).

1. TANDEM AIRSCREW-ENGINE ARRANGEMENT.

The first known arrangement of this kind was the Short S.37 "Double Twin" biplane with two 50 h.p. rotary engines, the pilot being sandwiched between them. This arrangement, characterised by a nacelle with one or two seats and engines at both ends, has since fairly often been copied, notwithstanding the obvious disadvantages as, for instance, in 1915 by Fokker with his experimental G.1 type, a twin-fuselage construction, by Siemens in 1916 with an experimental single-seater fighter, and in more recent times by Bellanca with a long-distance aeroplane of 1929.

It is, incidentally, interesting to note that Fokker returned to this arrangement in 1938 with his latest single-seater fighter.

The same arrangement has also been incorporated in the Palmer biplane two-seater of 1917 (1).

The non-central tandem arrangement seems to have at first been realised by I. Sikorsky in his first multi-engined aeroplane "The Grand" in May, 1913, and was subsequently given up as unsatisfactory. But in 1916, propeller tests made by C. Dornier proved so successful that the tandem arrangement was incorporated in nearly all flying boats, beginning with the type Rs. IIa (in replacement of the previous gear drive which was found to be heavy and unreliable). The tandem arrangement is also found in most German four and five-engined aeroplanes of the war period since about 1915-16, especially in the Staaken type of Prof. Baumann.

In recent times, an original tandem arrangement is shown by a Piaggio four-engined trans-Atlantic landplane of 1935. This is a monoplane with two tractor airscrews in front of the wing and two pusher airscrews behind it, while the engines are mounted directly at the wing.

2. CO-AXIAL OPPOSITELY ROTATING AIRSCREWS PLACED IMMEDIATELY ONE BEHIND THE OTHER.

This feature was tried in 1903 by the ingenious Levavasseur. His first monoplane, an unsuccessfully tested affair, had two four-bladed tandem airscrews (2).

In 1909 the late Ferber, a close friend of Levavasseur, incorporated two co-axial tractor airscrews in a biplane equipped with a 24 h.p. engine, the pilot sitting between engine and the airscrews. The latter were expected to turn with 600 r.p.m., having a diameter of 2.50 m. and a pitch of 2 m. (3, 4).

In a Howard Wright biplane, pusher airscrews were used, driven by a 50 h.p. engine with the use of a differential gear attached to the stationary engine. With this arrangement, the front airscrew had the greater diameter (5).

In the autumn of 1909, a Faure-Deperdussin "tail-first" monoplane was exhibited in a Paris store which had two tandem pusher airscrews driven by a 65 h.p. engine mounted in front of the pilot (6).

In 1910, the Pigott biplane had two pusher airscrews of this nature, with a planetary gear and a chain drive (7). A Schindler-Brzesky with an oppositely rotating engine and counter-rotating airscrews was tested near Vienna (8). The Bernh. Escher machine factory at Chemnitz designed a special "reaction-free"

rotary engine for the drive of co-axial counter-rotating airscrews. Four airscrews of this arrangement, but driven by a stationary engine, were incorporated in the Joachimczyk tandem monoplane constructed near Berlin.

None of these aeroplanes had any success.

The first successful flight with tandem airscrews was made by the late Hellmuth Hirth in February, 1912, in Johannisthal, near Berlin. This was with a Loutzkoy monoplane constructed by the Rumpler works and very similar to an enlarged Etrich "Taube," but having two 100 h.p. Argus engines driving two tandem tractor airscrews which were, however, at first of the same rotational sense. Hirth found the plane very easy to fly, and subsequent tests proved quite successful (9). The drive was protected by a patent (10). If I remember rightly, Hirth told me that, later on, tests with oppositely rotating airscrews were discontinued because of the lack of interest the authorities displayed in this early twin-engined affair. Anyhow, Hellmuth Hirth can be claimed to be the first man who has flown with a dual-rotation airscrew system on a conventional aeroplane. The exact date was February 19th, 1912.

In 1917, the Italian "B.T." single-seater design showed an oppositely rotating pair of tandem pusher airscrews at the stern of a fuselage of a normal biplane. The airscrews were driven by a bi-rotational water-cooled rotary engine, probably the only water-cooled rotary ever attempted (11).

In recent years, several engines have been developed for the drive of counter-rotating tandem airscrews. In about 1929, the double Fiat racing engine group consisting of two twelve-cylinder engines coupled together was evolved and later successfully employed. In 1935, the Lorraine Petrel "H.A.R.S." was designed for twin airscrews and installed in the Koolhoven F.K. 55 fighter of 1936. In 1937, a French Régnier twelve-cylinder engine for light fighters was equipped with a synchronised differential gear for the drive of two co-axial airscrews.

As with so many aeronautical "innovations," a study of the technical development shows that the evolution is often nothing more than the grasping of old ideas at the appropriate moment.

REFERENCES.

- (1) "Aircraft," June, 1917, p. 108.
- (2) Ferber, *Pas à Pas*, Paris, 1906, p. 40.
- (3) Hoernes, *Buch des Fluges*, Vol. 2, p. 97.
- (4) R. de Gaston, *Les Aéroplanes de 1910*, Paris, 1910.
- (5) *Flight*, 1909, p. 176.
- (6) "Flugsport," 1909, p. 752.
- (7) *Flight*, 1910, p. 383-386.
- (8) "Flugsport," 1910, p. 740.
- (9) "Flugsport," 1912, p. 189.
- (10) German Patent No. 263,059; "Flugsport," 1913, p. 730.
- (11) *Atti Del Primo Congresso Internazionale Del Motore a Scoppio*, 1927, p. 184-192.

I am, Sir, yours faithfully,

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