From 50 to 500 Miles An Hour

The spectacular increase in air speed is presented very vividly by

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A great many facts are packed into this article, which is all the more valuable because of the years of practical experience on which this famous aeronautical expert can look back

Supermarine Spitfires, with three-bladed variable-pitch airscrews, on parade at an R.A.F. station. Front cover shows a flight of Spitfires, credited with top speed of 367 m.p.h. and dived during tests at speeds in excess of 500 m.p.h.

FOR a period of, say, 5,000 years the maximum speed at which a man could travel on this earth cannot have varied appreciably. An ancient Egyptian of 3,000 B.C., driving a chariot at full gallop was probably travelling as fast as any human being ever did up to the beginning of the last century.

The first great speed advance was made by the invention of railways, and in the middle of the last century maximum railway speeds had advanced to about 80 miles an hour. In the last 90 years about 40 miles has been added to this figure, so that the record railway speed to-day is about 120 miles an hour, an improvement of less than half a mile an hour in each year.

This invention marked the first great advance in speeds in the history of mankind, but then came the aeroplane and the railway was soon outclassed. In round figures, speeds have increased from 50 miles an hour to 500 between the years 1909 and 1939, so that the average increase in each year has been 15 miles an hour.

I choose 1909 as a starting point because that was the year in which the first Rheims aviation meeting was held and at which a prize—the Gordon Bennett—was given for the fastest aeroplane. This was the first time that aeroplanes had been publicly tested for speed.

It is interesting to go back to 1909 and to see what happened. Two circuits of the course of a total distance of 20 kilometres, about 12½ miles, represented the distance to be flown, and as there were no less than 20 French entries it became necessary to hold eliminating trials. Most of the aeroplanes did not succeed in leaving the ground, and no one completed the course. The best performances were made by Bleriot, who flew about 1½ miles, Latham on an Antoinette monoplane who could only do 500 yards, Tissandier on a Wright machine, who remained aloft for 1 minute, and Lefebvre who nearly managed to complete the whole course.

The two best performances were considered to be those of Bleriot and Lefebvre, who were therefore appointed the official representatives of France. The eventual winner was G. Curtiss, of America, who covered the 20 kilometres in 15 min. 50 3/5 sec. at a speed of about 47 miles an hour.

Bleriot, who came in second, was very little slower, and he had the satisfaction of having made the fastest circuit of the course, at an average speed of about 47½ miles an hour. According to an eye-witness he would probably have won had he not been delayed in his last attempt by a severe gust of wind, which was alleged to have slowed him somewhat on his last circuit.

About 30 years afterwards, in March, 1939, a Heinkel monoplane, of German design and manufacture, attained an average speed of 463.9 miles an hour over a speed course arranged in accordance with International Regulations, his fastest speed being 486 miles an hour. The lower speed represents a mean of several runs over the course, and is the figure that is taken for record purposes.

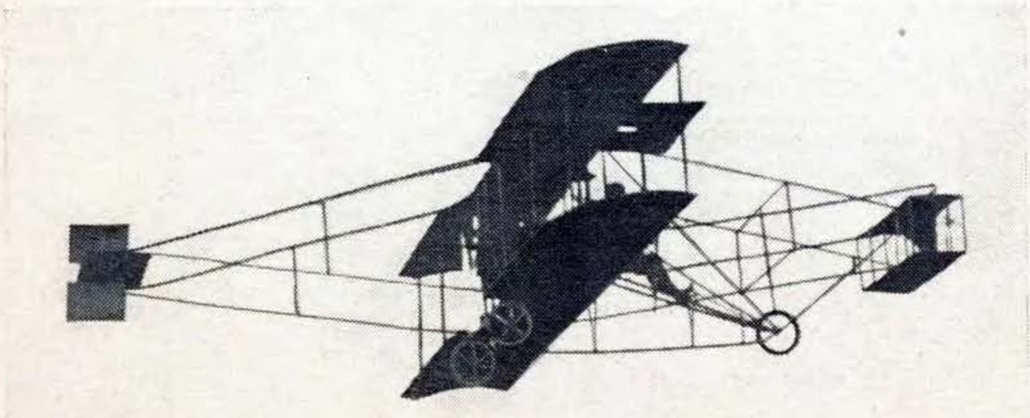
This Curtiss aeroplane can be taken as our starting point if we are to follow the developments in design which have taken place during these 30 years. Actually, our inquiries should be directed not only to the aeroplane but to the engine as well, for the development in one has kept pace with the other.

The Curtiss machine was a biplane with a pusher airscrew; there were booms extending forwards carrying a biplane front elevator, and booms extending rearwards carrying a tail plane and rudder. The pilot was seated between the planes entirely in the open—he had no protection whatever, not even a wind screen—and behind him was the engine driving a pusher propeller. The whole aeroplane was a complete mass of struts and wires, and there is no indication anywhere of any attempt to reduce air resistance.

The engine was a four-cylinder vertical watercooled, similar in arrangement to those found under the bonnets of most motor cars. Its weight is stated to have been 85 lbs., but this weight does not include such items as magnetos, carburetters, water and radiator, etc. Adding these, the engine weight comes out at about 192 lbs. The horsepower is given as 30, but it seems that as much as 50 could be obtained for short periods.

The weight of the machine complete with pilot and the normal fuel load of 2½ gallons of petrol was 550 lbs., and the area of the main plane was 272 sq. ft. So the wing loading, or the weight lifted per square foot of wing area, works out at about 2 lbs. per sq. ft.

Unfortunately we have not got such complete information about the Heinkel, but the machine is obviously from its photographs a



A "fast" biplane of 1909—the Glenn Curtiss—capable of nearly 50 m.p.h. Biplane front elevators were carried on forward booms, tailplane and rudder on rear booms.

very clean specimen of the modern cantilever low-wing monoplane, with a retractable landing chassis. The horsepower of the engine is not stated, but is probably about 2,000, and the wing loading, again not given, must be round about 40 lbs. per sq. ft.

So in 30 years the speed has gone up about 10 times, the wing loading 20 times and the horsepower 40 times, taking the Curtiss horsepower as 50. These figures are notable, for they represent thirty years' experience in aeroplane design.

The next machine we will resurrect in connection with this speed-hunt is the Sopwith Seaplane, built for the Schneider Trophy Race in 1914. It won this race very comfortably indeed, being very much faster than its French rivals. Its average speed over the course was about 86 miles an hour and the maximum speed was about 92. So that in five years the speed and horsepower had doubled.

This Sopwith seaplane was a very neat little biplane of the normal tractor type; it had a fuselage which had been designed with a view to reduction of air resistance. Its floats, however, must have added quite a lot to the total resistance of the machine, and the performance was very creditable. The engine was a 100-h.p. Gnome Monosoupape rotary, which was one of the best and most reliable engines of its time. In spite of this it is recorded that, during the race, one cylinder cut out and most of the course was flown on eight cylinders instead of nine.

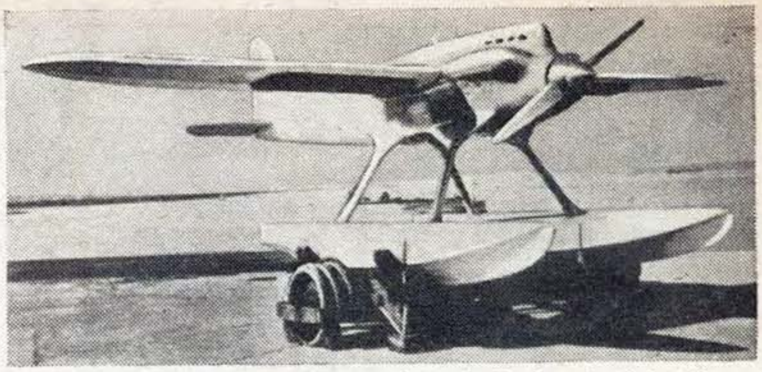
Then came the War, and the search for better aeroplanes had to be subordinated to military requirements. It is a fact that during that period aeroplane design languished. It is true that construction was developed, designers increased their knowledge of construction and learnt many lessons about such things as fittings and engine mountings, so that the aeroplane at the end of the War was a much better structural job than the earlier specimens.

But there was very little encouragement for the enterprising designer to try to design better aeroplanes. Long before his new carefully streamlined machine was out of the shops, there came a cloud of officials who proceeded to put guns, sights, bombs, flare carriers and all the other service equipment in exactly that position on the aeroplane where these things would be likely to do the most damage to an enemy.

Often this would mean hanging ungainly lumps of mechanism outside the fuselage. This process was called Christmas-treeing. After it was over the new aeroplane was no better than any other.

The only solution was to increase the power of the engine if a better performance was wanted, so that the 70 horsepower of the early Renault engine fitted to our first military aircraft had run up to about 400 in the latest type of Rolls-Royce. But there was no commensurate result in maximum speeds.

Scouts capable of doing 100 miles an hour were available at the beginning of the War, and the speed of our best single-seater fighter at the end was about 145. We owe to this period an intensive development of engines.



The Supermarine S.4 racing seaplane, built for the Schneider Trophy Contest of 1925, established a world's high-speed record at 226.75 m.p.h. before leaving for America. It was damaged before the race (which was won by James Doolittle, U.S.A., in a Curtiss Army Racer R.3 at 232.57 m.p.h.) and did not take part.

It was in 1920 that serious research into aeroplane speeds started again, and the results were seen in the Schneider Trophy race in that year. This was won by an Italian flying-boat, a Savoia, with a speed of 106.7 miles an hour—not much faster than the Sopwith of 1914, which was really a very poor result. The Italians won again in 1921, at a speed of 110.9 miles an hour.

In 1922 came the turn of the British, when the race fell to the Supermarine Sea Lion, with a 450-h.p. Lion engine, at 145.7. This machine can be considered as the last of the racing machines designed on the lines developed during the War, when horsepower rather than clean design was supposed to be the secret of speed.

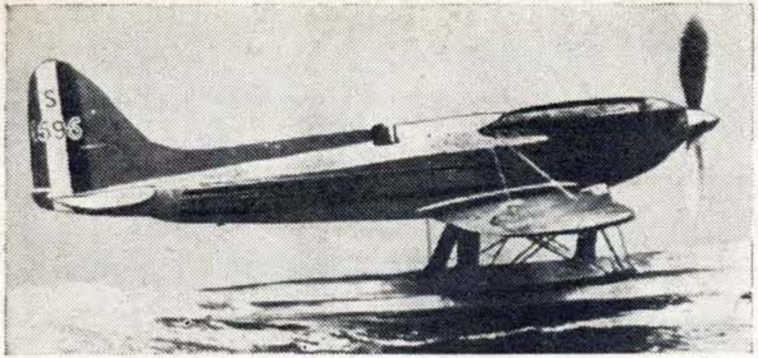
The 1922 Schneider Trophy winner, the Supermarine Sea Lion. With a 450-h.p. Napier Lion engine it averaged 145.7 m.p.h. Pilot was H. C. Baird, who later flew the S.4 on its record-breaking flight.

In 1923 the race was won by America for the first time at a speed of over 177 miles an hour. The American Curtiss flying-boat which won was an up-to-date version of the old Sopwith Schneider, much cleaner, and with 465 horsepower instead of 100. This Curtiss machine may be considered as the first of the modern racing machines. In the next race America won again, this time at a speed of 232 miles an hour, the engine horsepower being 1,400. Note how the horsepower and speed are going up.

We now come to the last three races, all of which were won by Great Britain; the years were 1927, 1929, and 1931; the respective engine horsepowers 980, 1900, and 2,300; while the speeds were 281, 328, and 340 miles an hour. Note that not even the 1931 machine, which was a twin-float monoplane, could catch the latest Supermarine Spitfire, which is some 30 miles an hour faster in spite of its carrying considerable military load, while the racing machine contained nothing but its pilot and the fuel.

High speeds require high wing-loadings; and even in 1931 flaps had not come into use, so the principal difficulty in controlling these racing machines was getting off and landing. Suppose this particular Supermarine S6 had had its floats removed and wheels substituted; it should have been much faster, especially if the wheels and chassis had been carefully streamlined. But there was no aerodrome in England which

Supermarine S.5 piloted by Flight Lieutenant S. N. Webster, won the 1927 Schneider Trophy contest for Britain at 281.656 m.p.h.



Flown by Flight-Lieut. J. N. Boothman, this Supermarine S.6B won the 1931 Schneider Trophy Contest for Britain at 340.08 m.p.h. This was the last Contest held, and the Trophy became the property of Great Britain.

would have been big enough for it to take off.

Hence the advantage of doing these high-speed flights with floats on and over the water. The floats certainly slowed them down, but speeds were possible which would have been impossible otherwise. The modern fast interceptor has two important advantages which were not developed in 1931. Flaps and (sometimes) variable pitch airscrews, and, in addition, no floats, or even chassis, to cause air resistance in flight. But that 2,300-horse-power Rolls engine was a masterpiece.

Put it into a modern Spitfire, remove the military load and add a variable-pitch propeller, and, if you can do it, clip some area off the Spitfire's wings—and I believe that even the latest racing German Heinkel with its 463.9 miles an hour would have to take a back seat.

These races taught us one thing, a thing which we really knew, but which somehow or other had been slurred over by precedent—that it is much more useful and much more important to reduce the air resistance of an aeroplane by, say, one pound, than to increase the propeller thrust by that amount. Turn up a copy of any aeronautical journal about the year 1925 or so, and look at the aeroplanes that were being built before the bad influence of the War years had disappeared, and before the streamlining lessons of the Schneider Trophy races had been taught.

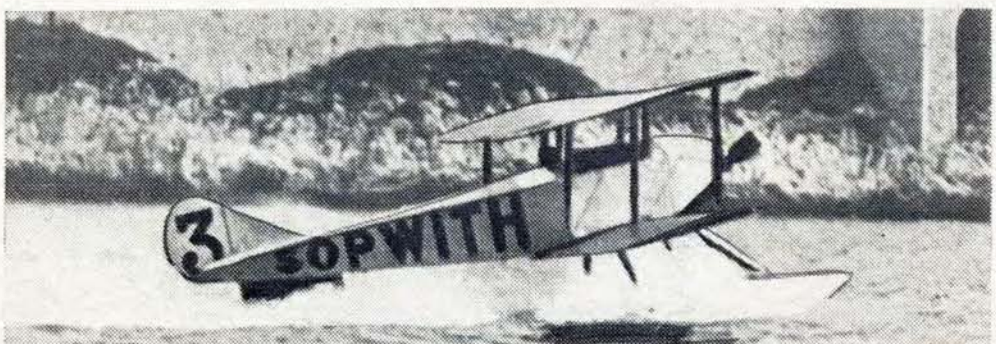
There were complicated chassis, clumsy fuselages, and often you would see stuck on the front the great ugly mass of a radial engine looking like a cast-iron chrysanthemum. Now look at a Hurricane, Spitfire or Blenheim, all of which, except the Blenheim, would take on and beat any Schneider Trophy racer—and the difference is obvious.

This Heinkel is not, of course, the last word. According to popular rumour, there is an aeroplane being built in England which should beat it handsomely. We could go on and on building faster and faster machines, up to possibly some 700 miles an hour, learning more about how to design aircraft with every racing aeroplane we constructed. And when we have got to the maximum, which must be at some figure below the speed of sound, we might try getting the same speeds with less horse-power. But this would cost money and would not pay dividends—though we should learn, and gold turned intelligently into knowledge is gold well spent.

It would be true to say that never, either before or since, have the improvements in aeroplanes been so rapid as during the period of the Schneider Trophy races. In this present period, with hectic rearmament and European unrest, there is no time for anything of this sort, but when the piping times of peace are here once more, and people again have time to think, then we must try another series of races, if possible organised on rather cheaper lines.

If this is done I am sure that, by all precedent, by all experience, and from a knowledge of the mental stimulus of competition, the result would be another jump in the improvement of aeroplane design.

Note.—Since this article was written a new world record of 469.2 *m.p.h. has been officially recognised.*



By way of contrast, here is the British Schneider Trophy winner of 1914. This Sopwith biplane had a 100-h.p. Monosoupape engine, was flown by C. Howard Pixton, and averaged 86.780 m.p.h.