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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

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THE DEVELOPMENT OF THE RACING AIRPLANE.

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November, 1922.

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The airplane races to be held at Detroit during this week, culminating in the Pulitzer Trophy competition on Saturday, should be productive of many broken records. The airplanes built especially for the races are the result of careful study on the part of the designers, and several of them incorporate radically new features making for the reduction of resistance and so for the increase of speed. The role of prophet is a particularly dangerous one in connection with aeronautical matters, but it seems safe to venture a forecast that the maximum speed attained in the straightaway trials will be over 210 miles an hour, a figure which may be better appreciated if it is realized that its continuous maintenance would make it possible to fly from New York to Chicago in under four hours.

Before the methods used for securing these tremendous velocities are described, something should be said as to the status and general usefulness of the high-speed airplane. Is it merely a vehicle of sport, a man-carrying projectile devoid of practical utility, or is it rather a valuable accessory in the progress toward the improvement of those airplanes designed for a definite task in commerce or in war?

It may be admitted that the fastest airplane at Detroit will probably be of a type not immediately applicable to any practical ends. When one quality, such as maximum speed, is sought far above all others, the rest are likely to suffer by the neglect,

* Taken from the Christian Science Monitor, October 9, 1922.

and racing airplanes in the past have not been distinguished by that ready and rapid response to the movements of the controls which is among the first requisites in a fighting airplane, particularly in a fast single-seater where the guns are fixed and where the direction of fire can be changed only by turning the airplane. The racing airplane in its most extreme form is, of course, debarred from utilization for any other purpose than racing, also, by the lack of space for the stowage of any additional load, either military or commercial. Calculated to carry nothing except a pilot and enough fuel to last for the duration of the race, and with the body cut to dimensions as small as possible while inclosing the engine, there is no opportunity for commercial load or for the mounting of armament.

To say that the racing airplane is of no immediate use for other purposes is not, however, to imply that nothing useful can be derived from it. The future is mirrored in the past, and the way in which the racing airplane of today may guide design of tomorrow is best illustrated by seeing what the modern commercial and military airplane owes to the races of previous years.

The account is an extensive one if we go back to the beginning. The first international airplane race was run in 1909, and was won with a speed of 46 miles an hour by an airplane in which the pilot sat out in the open with no protection and with no attempt to inclose pilot, engine, or anything else inside a smooth shell with a view to reducing the resistance. The wings of that early champion were braced with a multitude of wires, all fully

exposed to the wind, and the tail was carried on outriggers consisting of round bamboo poles and trussed with more wires. In th 13 years that have intervened since Curtiss won the Gordon Bennet Cup at Rheims we have seen the arrival, by way of the racing machine, of the airplane with a body fabric-covered for smoother an easier passage through the air. We have seen that body constantly improved in efficiency of shape, and we have seen introduced in a racing airplane the first body taking the form of a shell built upon a veneer, the fabric covering and the internal bracing wires alike being omitted. It was in a racing machine that a 100-horse power engine was first applied to a single-seater airplane, and the protests voiced in 1910 against the application of such absurdly and dangerously large power were numerous and vigorous, yet 300 horse power is only the normal complement of the typical single-seater fighter today.

The speed of the pursuit airplane today is only 150 miles an hour, and that of normal commercial flying about 100, but the first type certainly will keep hard on the heels of the true racing machine in respect of speed, and the commercial airplane also will follow, although in a more conservative manner and at a greater distance. Aeronautical history indicates that the record of yesterday is the speed of the military machine of today, and may be the ordinary commercial practice of tomorrow. When 60 miles an hour was first attained in 1910, the comments made and the criticisms of "tremendous and impractical speeds realized only by the use of excessive power" were almost identical with those sometim

applied to racing machines now. At the beginning of the war, no racing machines had ever exceeded 130 miles an hour, yet that speed had become the normal pace of the single-seater fighter before the Armistice was signed.

It is well to remember, too, that the racing airplane has always been a short step ahead of its pilot. Only by imposing new and more difficult problems to solve is it possible to develop the capacity of those who must solve them. At each new stage of advance it has been declared that the limit is reached and that human endurance can stand no more, yet the man always rises to the test and pilots are found for 200-mile airplanes as readily as for machines of half that speed 10 years ago.

The major contributions of the racing machines have been in the direction of modifications in design making it possible to cut down the resistance to motion through the air, and this year's race is especially interesting in that respect. Already the airplane has been smoothed and streamlined so that there seemed but little possibility of further improving the body, and the bracing of the wings had been reduced to a single strut and a couple of wires, the wires themselves being of stream-line, or fish-shape, section instead of round. There remained, however, two elements of the structure which had to be exposed to the air and which offered a great proportion of the total resistance. These were the radiator and landing gear. In some of the airplanes produced for the current races, however, both of these parts have been eliminated so far as their effect on resistance is concerned. The radiato-

is replaced by an assembly of flat tubes set flush with the surface of the wing itself. The air flowing over the wing passes these tubes and so cools the engine water without the introduction of any additional cooling surface or element placed out in the open. There is no more resistance from the flow of air over the heated tubes of such a radiator than from its passage over fabric. The landing gear has been suppressed when in flight by making it possible to fold it. The wheels are withdrawn into the body after leaving the ground and are lowered again just before landing. The airplane has not always profited extensively from imitation of natural flight, but it appears that we are now to gain by copying the manner in which a flying bird draws its feet, which forms its landing gear, up against its body.