CORRESPONDENCE.

To the Editor of the JOURNAL OF THE ROYAL AERONAUTICAL SOCIETY.

SIR,—From the viewpoint of the aeroplane designer, I was particularly interested in Mr. Relf's recommendation in his lecture on " Recent Research on Aerodynamics " for the improvement of lateral stability near the stall by means of appropriate shaping of the wing tips, with tapered wings.

A similar arrangement has been used for a small low wing monoplane I designed in 1936 and tested first in January, 1937. This light single-seater, the Dart Kitten, has a tapered cantilever wing which combines perfect flying qualities in stalled and unstalled conditions with good performance, as proved by extended flight tests.

The following figures were derived from performance tests and competitions :—

Climb near the ground, $\eta^2 C_L^3/C_D^2 = 47.5$.
Maximum speed at 1,000ft. height, $\eta/C_D = 21.6$.
Stalling speed at 1,000ft. height, $C_{Lmax} = 1.7$.

The Kitten has been tried by about 200 pilots of vastly different experience (between 6 and 4,000 hours flying) without the slightest incident, and every pilot found it exceptionally easy to handle.

The aerodynamic design of the Kitten wing was based on the intention to obtain with simple means, a non-vicious stall with lateral control at the stall, and to safeguard against tailplane buffeting with which I have previously had some acquaintance in low wing types.

In order to exclude buffeting, the centre section of the wing, covering the span of the tailplane, was designed with a wing section having a very gradual stall in the range of all practically occurring Reynolds numbers. I chose the N.A.C.A. 6318 aerofoil. The sections of the outboard wing were derived from the N.A.C.A. 230 series which show a front stall. For the wing tip (at 96.6 per cent. of the semi-span) the N.A.C.A. 4409 section was chosen.

An aerodynamical wash-out delays the stalling of the wing tips and safeguards the aileron control near the stall, the range of incidence between no-lift and maximum lift being greatest at the wing tips. Dr. Lachmann has referred to the combination of twist with change of camber in his paper dealing with the features of tapered wings.

The wing of the Dart Kitten has a single spar with shear boxes, a ply covered wing nose taking the torsional loads. The distinct gull-wing shape near the tips is the result of the aerodynamical arrangement mentioned.

The Dart Kitten proved to have a non-vicious and a very gradual occurring stall. When stalled the plane was merely sinking on an even keel with complete aileron control. Solely with the help of the very powerful rudder a spin could be effected, the check of which was easy and rapid. In a completely stalled condition with the engine throttled back, only a negligible amount of tailplane buffeting could be discovered (no wing root fairing). It was harmless and therefore perhaps even useful because it was the only sign of warning that the plane was flying stalled (besides the loss in height). In a power stall buffeting did not set in.

According to this experience I should say that the use of cambered wing tip aerofoils with rearward position of the maximum camber has proved successful for the prevention of wing dropping. But at the same time I should hesitate to recommend this arrangement for very fast aeroplanes; under certain conditions wing flutter might be expected.

Further, I should like to refer to a German Messerschmidt patent of 1934 (D.R.P. No. 635,568) for a wing with delayed stalling wing tips, obtained by providing the nose of the aerofoil at the tip with a bigger radius than those in the central part of the wing, in order to secure a different range in the incidences. The underlying idea is apparently based upon the tests described in N.A.C.A. Techn. Note No. 416 (Characteristics of two sharp-nosed airfoils having reduced spinning tendencies, by E. N. Jacobs). I am not aware if this interesting proposal has found any application up to now, but I think it should work well, apart from the problem of aerodynamical efficiency.

Yours, etc.,

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