A TALK ABOUT WAKEFIELDS

by N. L. Lees

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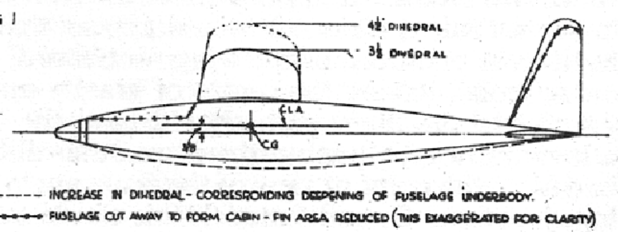
This hobby of ours has many avenues of approach and, although I am well past my best athletic years, I still enjoy a bit of good competition flying. Having had some success and a good deal of experience, this seems to be a good opportunity to pass on, in a practical way, some of my experiences in the design, construction, and flying of my favourite, the "Wakefield Model."

The general arrangement of the model will be the first consideration. Past results have shown that the high and shoulder wing types give the best results, and my own preference is for the former, although its superiority, if any, is slight. Provided that it is not overdone, the high-wing type seems to climb better on less power and requires less dihedral to give the necessary lateral stability. You are probably saying to yourself, "What about down thrust?" If either model is designed and trimmed correctly, the difference in down-thrust will be negligible. It will be understood that to obtain consistent results the model must be inherently stable. The design of the fuselage, which should always be considered in conjunction with the rudder and wing dihedral, for reasons which will be seen later, has an important bearing on stability.

To obtain lateral stability, the position of the centre of lateral area should be in a position one-half to three-quarters of an inch behind the trailing edge of .the wing, and also in such a position that when a line is drawn through the centre of gravity and parallel to the longitudinal centre line of the fuselage it should cut through the C.L.A. (Fig. 1). In practice, this point will be approximately 3/8 in. above the centre line of the fuselage, and is fixed chiefly by the wing position and the weight of rubber motor. It will be seen that if the dihedral is increased, say, from 3-1/2 in. to 4-1/2 in. the C.L.A. would be higher, and should be corrected by increasing the area of the underside of the fuselage shown by dotted lines (Fig.1). Similarly, if the nose of the fuselage is reduced to form a cabin for the wing, the rudder area will have to be reduced; this is a desirable feature because it tends to improve spiral stability.

FIG 1



Owing to the slow flying speed of model aircraft, it is doubtful whether a streamlined model has much advantage over the slabsided type from an aerodynamic point of view, but in practice the former has many advantages. In serious competition flying, it is essential that the competitor should be able to get the maximum turns on the rubber motor. In doing this, there is always the risk of the motor breaking. It is, therefore, desirable that the fuselage should be constructed so as to stand up to a rubber break without serious damage, This was brought home to me very forcibly in the Wakefield Cup Competition in America in 1939, and I spent much time, coming back on the boat (ed. note: Germany started WWII a few weeks later), pondering over the best way to solve the problem without adding appreciable weight.

The solution was found in the construction of a streamlined fuselage of circular or elliptical section with not less than 24 one-sixteenth square stringers and bulkheads made of 4 turns of bass wood 1/8 x 1/64, wound on formers, the laminations being glued together wIth "Durofix, the whole fuselage double covered with superfine Jap tissue cross grained.

A well-designed fuselage 35 in. overall length constructed in the above manner can, with experience, be made down to a weight as low as 1.7 oz. when new, and capable of withstanding anything within reason, including a nose dive under power, and a motor break, without serious damage. It is questionable whether comparable results could be obtained with any other type of construction. .

Apart from appearance, there seems to be little advantage of one shape of wing over another. The important points are aspect ratio, which should be not more than 11 to 1 and not less than 8 to 1. The aerofoil should be carefully chosen, and the most popular ones in use today seem to be R.A.F. 32, Clark Y, and Eiffel 400. The wing ribs must be accurately cut to the correct shape and should not be more than 1-1/4 in. apart. Accurately made wings are one of the secrets to success. They should be strongly constructed to avoid the possible chance of warping in changing atmospheric conditions. This also applies to the tail plane, which should be kept as light as possible in order to keep the moment arm long. If twin rudders are used, their total area should be about 15 per cent greater than the single rudder, and the aspect ratio of the tail should be kept low, otherwise instability may be experienced. under power.

The size and pitch of the airscrew will depend on the amount of power used and the total weight of the model.

If a medium rate of climb is preferred and the total weight is between 8 oz. and 8-1/2 oz., a 17 in. or 18 in. dia. 1.3 pitch airscrew carved from 2 in. by 1-1/2 in. block, with 12 strands of 1/4 by 1/30 rubber, will be required, or as an alternative 18 in. dia. 1.5 pitch carved from a 2 by 1-3/4 block, with 18 strands 3/16 rubber could be used. These figures should be taken as a minimum and the number of strands should be increased for higher rate of climb or increased weight, with a corresponding reduction in prop run.

The above remarks refer to two-bladed airscrews, which I have always found superior to the single-bladed type.

Freewheel versus folding airscrews is an interesting. problem, and some observations here will not be out of place. There is no doubt that the reduction in drag of the latter is considerable, and this alters the trim of the model in the following way. For a given weight and centre of gravity position, the main wing incidence must be reduced, owing to the increased speed caused by the reduction of drag. The increase in speed is not a desirable factor, because the time the model is in sight is what matters. Again, the reduction of main wing incidence. makes the model less stable in a longitudinal direction. These disadvantages can be improved to some extent by moving the centre of gravity forwards. This increases the main wing incidence and we are then part way back to the original. Another troublesome feature is the movement of the centre of gravity when the airscrew blades fold, but this can be remedied by arranging Some form of weight to move forward when the rubber motor tensions. I have been flying a model for three years fitted with an undercarriage which retracts forward when the motor tensions and the weight is such that the centre of gravity is undisturbed.

To sum up, it would appear that on calm days a machine with folding airscrew is best, but more tricky, to fly than a model with freewheeling airscrew, which is still good enough to fly out of sight on average competition days. However, we must not forget that the last two Wakefield Cup Competitions were won with machines with folder.

Editors Notes: This is a remarkable document, doubtless written in late 1943, while England was suffering terribly in WWII, and published about the time of D-Day. Quoting from the journal: "The Society of Model Aeronautical Engineers was created shortly after WWI for the purpose of encouraging the development of model aviation in all its phases. ... When the blitz came during WWII, the SMAE met regularly at the Royal Aero Club, even though that building suffered in the bombing. "Month after month these men kept on. Firewatching, Home Guard duties, their living, none of these things prevented them from carrying on. Not one member resigned." The Brits are truly remarkable people.N.L. Lees was a pioneer from the north of England and a member of the 1939 British Wakefield team. He was perhaps best known for the excellence of his streamlined Wakefields.