

NONSENSE OF WINGLETS

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To my knowledge, three rather successful approaches have been tried to improve the performance of gliders by the use of winglets.

The examples I refer to are: The ASW 19 from Akaflieg Braunschweig, as an example for a standard class glider; the ASW 20FP from Centrair, as an example for the FAI 15-meter class; and the ASW 22 (22m span version) of Walter Neubert.

The advantage of winglets for low speed performance has been proven by all the gliders mentioned above. The reason for this is that the induced drag is reduced even less than the value for an elliptic straight wing of the same span.

It must be carefully regarded and kept in mind that this advantage is gained by a normally negligible increase in bending moment of the wing in the highly loaded areas near the wing root.

However, the advantage at low speeds is partially compensated, or even overcompensated, by additional drag at high speeds. As Mr. U. Dressler from Akaflieg Braunschweig has demonstrated in his excellent university design exercise (please remember his OSTIV paper read at Hobbs, NM), this disadvantage results from two components. One part is the additional friction drag of the winglets themselves, the other part results from the induced drag of the winglets, which is overcompensating the (reduced) induced vortex of the wing at high speeds.

For the ASW 20FP not so many performance data points are available, as for the ASW 19 of Akaflieg Braunschweig. However, comparison flights of the Swedish National Team before the World Championships at Paderborn between an ASW 20 and an ASW 20FP made by Goran Ax and Ake Patterson indicate that the performance gain at low speeds was in the same magnitude as measured for the ASW 19 whereas the penalty at high speeds was somewhat less than for the ASW 19.

As a last, and it is hoped to be the last, try for winglets Mr. Walter Neubert designed and built a set of small winglets

for his ASW 22 with my assistance. These winglets had trailing edge "flaperons" which were connected to the outboard flaperons of the ASW 22 by a gearbox.

The reason for this interconnection with the flaperons is to minimize the induced drag of the winglet-to-wing combination over the whole speed range. This is not possible with a rigid winglet as designed for the ASW 19 or the ASW 20FP.

I hope that W. Neubert can persuade the IDAFLIEG students to test the ASW 22 with and without winglets in this year's meeting, so that I can give good test results.

Why is the winglet a nonsense?

The reason why the FAI/CIVV set a span limit to the standard class and the 15-meter class was to keep down structural weight and cost.

Compared to a more effective increase in wingspan the winglets are relatively expensive as they must be detachable for transport. Despite the fact that winglets do not usually require a noticeably stronger wingspar, the problem of wing flutter due to lower torsional frequency of the wing/winglet combination require more torsional stiffness of the wing by use of more glass fibers or even the use of fibers of more exotic material.

As the performance effect of the winglets is in all cases inferior to that of an increase in span, which is cheaper to provide by the manufacturer, the winglets must be regarded as a nonsense from an economical standpoint.

Winglets are strongly violating the intention of the FAI/CIVV for span limiting rules.

Therefore, OSTIV should propose a rule to FAI/CIVV which should allow bent-up or bent-down wingtips or wingtip skids of a certain size which are fixed to the wing and cost no extra money. A special regard should be given to flying wing or canard configurations where the "winglet" is the vertical tail at the same time and not an additional structural component.