Peter Wick's Airfoils for Plank Planforms

by Peter Wick

I wrote a series of articles about the design of flying planks for the German *Aufwind* magazine. My PW airfoils are very well proven and there are a couple of commercially available airplanes on the market which are equipped with these airfoils.

Some comments on the airfoils:

They are made for planks, but because of their pitching moment of around zero they will also have some application for swept wings.

In my opinion, the design of airfoils can not be seen independent of the design for the airframe, therefore some remarks, which should act as a guideline for airplane designs with those airfoils.

All the airfoils are made for slope flying, also DS, F3F, and so on, apart from the PW 1211, which is designed for a SAL plank flying wing, but for the design of the whole aircraft the aircraft should be designed the same way.

This means to me:

- low drag at $c_l = 0$ and a high c_{lmax} for sharp turning and aerobatics or thermalling with the PW1211
- the pitching moment curve should be as flat as possible, even with flaps
- the pitching moment should be around zero (not for the PW75, and the PW1211 which have a somewhat more positive c_m), so that the plank is flying at high speeds without flap deflection and with minimal drag. All other angles of attack need flap deflections.

These airfoils were originally designed for 20% flap chord, but in reality there was not a big difference for flap chords between 20 and 30%. The hinge should be on the underside!

PW51: mainly made for slope flying and aerobatics.

I made it in 2003 and is somewhat still my main design. It is made for planks as all the others, but the lift range is extended to c_l's below zero for aerobatics and a lot of fun.

It is well proven... 180km/hr in DS and was able to win the Danish championship in pylon racing. Pitching moment is around zero.

PW106: mainly for more thermal oriented slope flying, and

PW98-mod: more sophisticated slope flying, more accurate building required.

These are both modifications of the PW51. They have higher camber and therefore a higher c_{lmax}. On the other hand, the c_l range does not extend to negative c_l, so aerobatics is negatively affected. But for a DS model the PW98-mod looks very promising. Both airfoils should thermal very well. Pitching moment is about the same as for the PW51.

PW75: mainly made for slope flying and aerobatics with more positive c_m.

The PW75 is a modified PW51 with some more reflex. This gives a higher pitching moment, so planks will fly with a c_l about 0.4 with no flap deflections.

This airfoil is well proven and seems to work fine, both on the slope and on the flat field in thermals.

PW1211: made especially for a SAL plank project. The PW1211 was only published on the German forum "rclines" because there was a special need for a SAL flying wing plank.

The c_m is a bit positive and the airfoil will therefore need a tiny bit of down trim (+0.5 degrees) as a preset for the launch.

Coordinate files for all of these PW sections can be downloaded from: <www.b2streamlines.com/ PWairfoils.html>