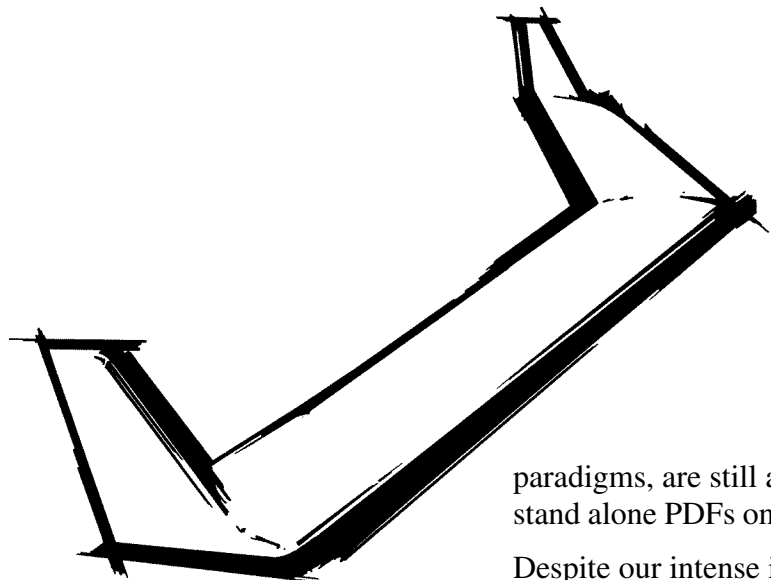


# On the 'Wing...

by Bill and Bunny Kuhlman  
<bsquared@themacisp.net>



*Redwing*

As many followers of this column will attest, our primary interest has always been tailless aircraft with swept back wings. In fact, our interest in tailless sailplanes began with a swept wing design by Curt Weller, his Elfe 2.

Over the years, we've explored various aspects of swept wing planforms, starting with spar structures, then moving on to a discussion of wing sweep and required wing twist. Two articles on rather specific topics, sweep and effective dihedral and a comparison of various wing twist

paradigms, are still available as stand alone PDFs on our web site.

Despite our intense interest in swept back wings, we now find ourselves gravitating toward wings which exhibit more of a "plank" planform. While wings with sweep back have a number of positive aspects, we're finding their negative points make design of a viable planform more difficult. The internal structure must be able to remain rigid along the spanwise dimension and withstand substantial torsional loads. Despite this extra strength, the wing twist is always being changed by even small amounts of wing flex.

After attending the first of two of Jim Markse's workshops, our focus began to shift to wings with little sweep. This planform makes the spar structure and connecting

mechanics a lot easier to build while making them both stronger and lighter.

This thinking has been subtly reinforced over the years through our flying of several Dave Jones designs - the *Model Builder* Raven, a Raven 2M, the Blackbird planform, and the R-2.

All of these have been to our mind very good flyers. They have excellent stall characteristics, behave as expected, and thermal in exceptional fashion.

Our current interest in wings without significant sweep came about while building and flying Michael Richter's Alula. This EPP foam wing delivers performance which is greater than would be expected from an aircraft of such small size (34 inch wing span, maximum chord under nine inches).

This Alula has the same positive qualities as the various Jones designs, with the exception of the stall characteristics. This is not to

say anything negative. The Alula stall characteristics are just different. It exhibits a more dramatic blanking of up elevon as the angle of attack is increased, and a more mushy flight at the stall. Some or most of this is no doubt due to the full span elevons, but there is also a bit of influence from the slightly swept forward quarter chord line.

While a swept back wing has outboard flow, a wing with sweep forward can be made to have some amount of inboard flow, changing the stall characteristics.

For more predictable thermal turns, the Alula planform needs to have a bit more dihedral. But incorporating that increase means a deterioration of SAL performance — less height and a lot of yaw-roll coupling which makes control difficult. For a winch launched sailplane, however, an increase in geometric dihedral does not adversely affect the launch, and so can be easily incorporated.

The Akaflieg Berlin B-11 has a large amount of dihedral to compensate for its 18 degree quarter chord line forward sweep, but for wings with lower aspect ratios and less forward sweep, such severe dihedral is not at all necessary.

In formulating a design for TD competition, we decided to start with a known quantity — Dave Jones' Blackbird 2M. We have built seven versions of this design, from 59 inch span all the way to XC size, always with very good results, so we felt confident in making a single major change to the planform.

The drawing to the right shows the results of this redesign philosophy. We simply took the spar, which originally had eight degrees of sweep back, and flipped it forward. From there, the overall wing planform was drawn using the new spar location as a reference.

Additionally, we separated the control surfaces so there is now a central elevator, and we enlarged the span of the ailerons while reducing their chord. We also reshaped the vertical fin and rudder to reduce the hinge line sweep and aspect ratio.

We're planning to build both a two meter and XC version of this new planform, code name Redwing, and will keep *RCSD* readers up to date!

