STABILIZER SECTIONS FOR SCALE MODELS

by Bill Henn

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It has always been a mystery to me as to why almost all scale modelers use flat plate stabilizers since they are inferior to symmetrical and flat bottom lifting sections in just about all respects. The most likely reason may be that they are simply following traditional building practice, but I also suspect that many modelers are just not aware of the superior characteristics of lifting sections.

The only advantages to a flat stab are that it is easier to construct and that it can be made slightly lighter. However, flat stabs are much less resistant to damage and far more prone to warpage. More important, flat stabs have low lift and stall more easily because of separation at the nose at low angles of attack. Why use them when the role of the stab is to provide lift so as to keep the wing happy and the flight stable?

There has been a recent trend among some endurance flyers towards making their stabs symmetrical, limiting the maximum lift that's generated by the stab but keeping the flow over the top under control by the addition of turbulators and invigorators. In a scale model with an advanced CG, the use of symmetrical stabilizers may be appropriate. Semi-symmetrlcal stabs may also work well because they will not stall abruptly like flat sections.

Years ago, I switched from building models for flying in AMA and SAM endurance competition to FAC Scale. Since all of the endurance models I had been flying used flat bottomed lifting stabs, I thought it best to use similar structures on my scale models. They worked very well and I have continued using them up to the present, even on Peanuts. The sections I use are similar to my 10% thick wing sections, only thinned down to about 7% thickness.

These flat bottomed lifting stabs have numerous advantages over flat plate stabs. They are much more resistant to warping and, with care, can be built almost as light as a flat stab. Most important is fact that flat bottomed cambered stabs increase tail volume. This permits a more rearward CG and the use of less decalage, making the model more loop resistant. Furthermore, the model can be made lighter because less ballast and/or a lighter propeller can be used. Most of my models, including the Chambermaid, balance at about 40% of the chord. My Helio Stallion balances at 50% of the chord. Both the Helio and the Chambermaid require no ballast and use light, carved props. The rear pegs are located directly in front of the leading edge of the stabilizers. This gives them a big advantage in the length of the motor used and, consequently, the motor run time. At recent FAC Nats, these models were reaching very high altitudes with 90 second motor runs and achieving maxes on most of their flights.

As far as appearance is concerned, flat bottomed cambered stabs can be made smaller and more true to scale while providing the same tail volume as larger, flat plate stabs. Besides, they look more realistic on World War II fighters and most modern subjects. I'm not sure whether scale judges give this aspect of model construction a great deal of consideration or not, but every point garnered is one step closer to a kanone.

Regarding the determination of CG, I have no idea how this is calculated by other rubber scale flyers. The well known author of an article published in the FAC News several years ago suggested that 25% of chord should be used for all scale models. This may be OK for short nosed subjects with relatively small stabs, but would grossly reduce the performance of subjects with better proportions such as those noted above. A fairly good way to calculate CG position for optimum performance was developed some years ago by the well known French free fIighter Rene Jossien. The "Jossien Equation" factors in the things that matter such as tail moment, stabilizer area, stabilizer airfoil, etc. Only simple algebra is required to use the equation. For those interested, it can be found by going to Google on the internet and typing "Jossien Center of Gravity" in the search block. Several sites will come out, one even offering a free download of a program to do the math.

Finally, another thing that baffles me is why many of the most talented scale modelers adorn their museum quality masterpieces with crude, extremely low pitched molded plastic props such as the gray Peck types. Carved, or even the higher pitched yellow Czech props, scraped and painted, would look much better and yield far greater performance. Perhaps this could be a matter for future discussion.