QUESTIONS AND ANSWERS

In response to Question #40 (April '67 INAV), about advantage of high aspect ratio stabs, Charlie Sotich has offered the following information from Dec. '47 Air Trails.

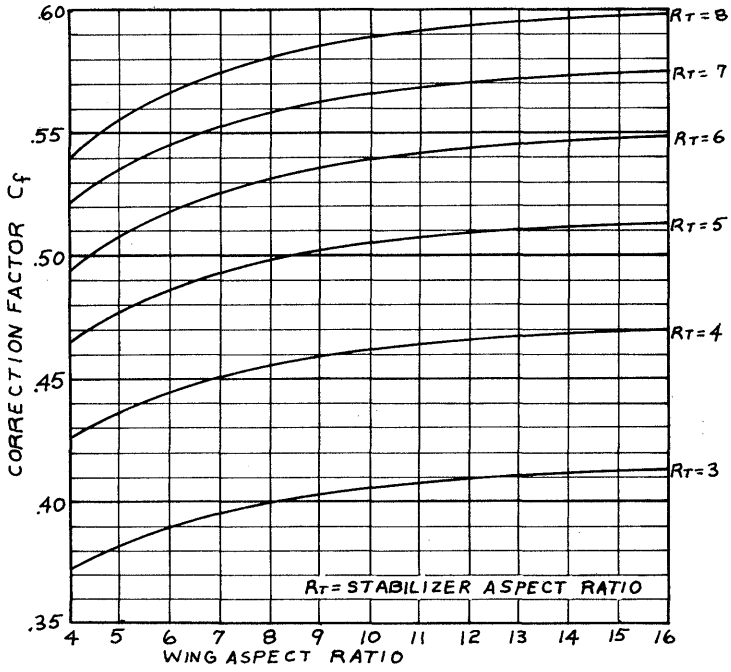
The aspect ratio of a lifting surface changes the rate of change of lift with change in angle of attack. For any model which makes a given change in angle of attack, a stab with high aspect ratio will increase in lift faster than a stab with low aspect ratio. The graph and example below illustrates the effect of this phenomenon on permissible location of CG (for equivalent longitudinal stability of the model).

To illustrate, we assume a model with rectangular surfaces; 100 sq. in. wing (6:1 A/R), 16" tail moment arm measured from 25% of mean chord on wing to 25% of mean chord on the tail; vary the aspect ratio of stab from 3:1 to 6:1. The wing dimensions will be 4.1" x 24.5"; one stab will be 3.65" x 10.9" and the other 2.58" x 15.5".

Refer to Step 4 of instructions below the graph, and to Fig. I which details the model with low A/R stab. To locate the A.C. (aerodynamic center) of the model, read C_f of .39 (3:1 A/R) from the graph and compute:

A.C. = $\frac{\text{stab area}}{\text{wing area}}$ x tail moment x .39 = .4 x 16 x .39 = 2.5

This result shows that the A.C. should be 2.5" behind the 25% mean chord of the wing. Now, locate the C.G. 25% of one chord ahead of the A.C. (the 25% chord figure is an arbitrarily assigned value, and can be "juggled" slightly for more or less stability as your own design permits. A similar computation for the case with stab A/R of 6:1 yields 3.3" behind the wing quarter-chord point. Using 25% of wing chord as multiplier, C.G. in the first case will be 1.69" ahead of the wing T. E. In the second case, the location would be .83" ahead of wing T. E. To couple this information with that concept presented in the April '67 issue, the model using 6:1 A/R stab will have an 80% CG (vs. 59% for 3:1 A/R stab version) and the model can be .8" shorter from the wing quarter-chord to end of stab. In addition, it may work out that the 80% CG location may permit the wing to be far enough ahead to further shorten the tail boom and yield a lighter model.



METHOD FOR DETERMINING POSITION OF C.G.

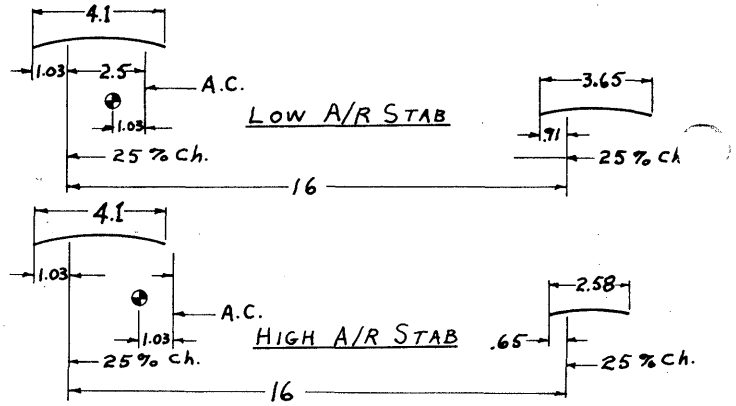
STEP I Measure tail moment arm between 25% point on the average chord of wing and stab.
AV. CHORD = Area/Span

STEP II Find Aspect Ratio of Wing and Stab
Aspect Ratio = Span/Av. Chord or Span^2/Area

STEP III Find C_f from graph

STEP IV Find distance from 25% point of wing to A. C.
A.C. = $\frac{\text{stab area}}{\text{wing area}}$ x Tail Mom. Arm x Cf

STEP V Locate C.G. 25% of average chord ahead of A.C.



A word of caution or reminder: this computation is based on using the mean chord of wing and stab, rather than the root chord. In the example, rectangular surfaces were assumed. In this case only will the mean chord and the root chord be the same.

THE TRAINING OF A CHAMPION

Not very many people know that Hans Beck, 1966 Indoor World Champion, was totally inexperienced with 90 cm. indoor models a few short weeks before the Championship at Debrecen, Hungary. He freely acknowledges that his training under Karl-Heinz Rieke (1962 World Champion) made the difference, but this in no way takes away from Beck's high degree in competence with free flight models in general.

As space permits, we will present copies of letters which passed between Hans and Karl-Heinz, shared with us by Hans and translated by Manfred Koller. This will trace the way Hans took from FAI Power flier to Indoor Champion.

Nurnberg 3/6/67

Dear Karlheinz!

I was idle in modeling for a long time now. The winter was not very eventful, in aeromodeling of course only. The last weeks were somewhat hectic because of the internat-n-al toy exhibition. (Ed. note: Hans is a toy designer a big plastic firm in Nurnberg.) This is now over and have time to devote to indoor modeling. To my surprise I was selected to represent Germany, together with Strattner and Hacklinger, at the World Championships.

So I have a request: do you have any kind of indoor devices, material and wood you do not need any more? I especially think of the thin quarter-grain balsa sheets you gave me once. Also, bracing wire would be helpful. If you don't have anything of this kind any more, I would be very grateful if you could tell me where I can get this supply.

In May or June we will make a little meeting at Nurnberg and it would be nice if you would also come with one of your models.

Best regards,
Hans

Berlin 3/11/1966

Dear Hans!

Many thanks for your sign of life. I will answer in a hurry and please answer as fast as possible, because I am only in the coming week at Berlin to collect all the things you requested.

First I want to help you with supply. I can send you wire and the thin sheets. Balsa for the wings and stab I also do not have. You can buy it when you select in your local hobby shop carefully.

To my opinion are Hacklinger's and my model the optimal possibility and it would be nonsense if you would try in the very short time to build after your own design. I would say, you should build my models exactly as I did. Then the risk should be at a minimum. Have I written about the weights of the different parts of the model? You should stay for for the first models approximately 25% above my weights. Then you will have a model which surely flies 35-40 minutes (at Cardington).

Of course I will send you my model boxes, also the jigs and templates. If you have any detailed questions, it would be best if you would visit me at Berlin on one of the coming weekends.

The site at Debrecen is so high that one can fly wit an excellently trimmed model approximately 35 minutes. But, the ground area is relatively small. So it will be necessary to change the original design in view of the very small circles. It will be the best if you enlarge the original washin on the inner wing. I will tell you in my next letter how much and I will also send you pictures of the site at Debrecen. Now send as soon as possible your list about what you want.

Best regards,
Karlheinz