POSITION OF WING TONGUE

BRASS WOODSCREW ⊕ C G

3/8" x 1/8" BALSA

CUT OUT FOR BALLAST

3/8" x 1/8"

20 G WIRE LINE ADJUSTMENT

FUSELAGE COVERED EACH SIDE WITH 1/16" SHT COVER WITH SILK OR NYLON

FIT FIN & RUDDER AFTER COVERING

3/8" HARDWOOD

3/8" x 1/8" OBECHI

TOWHOOK 14 G

WASHER OR BRASS RING

LINE GUIDES FROM SOFT PINS

18G

T E 3/8 x 1/8

1/16" STRIP RIBS

1/16" SHT

SANDPAPER OR RUBBER

RIB AT BOTTOM OF FIN 1/16" SHT

1/16" SHT

T P PLATPORM

1/8" DOWEL

18G

SPAR 1/8" SQ

18 G

UNDER FIN FROM 1/16" PLY BETWEEN 2 LAYERS 1/16" BALSA

SANDPAPER OR RUBBER

1/16" PLY T P PLATFORM CRACK TO GIVE ANHEDRAL

NYLON HINGES

TIPS FROM 3/16" SHT

1/16" PLY

3/32" PLY RUDDER HORNS

L E 1/8" HARD

1/16" SHT

RIBS 1/16" SQ CUT FROM SHEET FROM TEMPLATE

2" ANHEDRAL AT TIPS

1/16 SHT TO SPAR TOP ONLY

L E 1/4" SQ

1/16" SHT

SPAR 1/8" SQ SPRUCE

SPAR 1/4" x 1/8"

1/16" SHT GUSSET

R1 R2 R2 R2 R3 R3 R3 R3 R3 R3 R3 R3 R3 R3 R3 R3 R3 R3 R4

LIMIT OF 1/16" SHT ON UNDERSIDE

TE 3/4" x 1/8"

WING TONGUE 4 MM PLY

RIBS R1	3/16" PLY	2	OFF
RIBS R2	1/8" PLY	6	OFF
RIBS R3	1/16" BALSA	42	OFF
RIBS R4	3/16 BALSA	2	OFF
RIBS R5	1/16" BALSA	2	OFF

COVER TO 4 TH RIB WITH NYLON TOP & BOTTOM

TIPS 5 LAMINATIONS OF 1/8" x 1/32"

R4 R3 R3 R3 R3 R5

5° DIHEDRAL PORT TIP

4 3/4° DIHEDRAL STBD TIP

1 1/2" WASHOUT AT TIP

NYLON

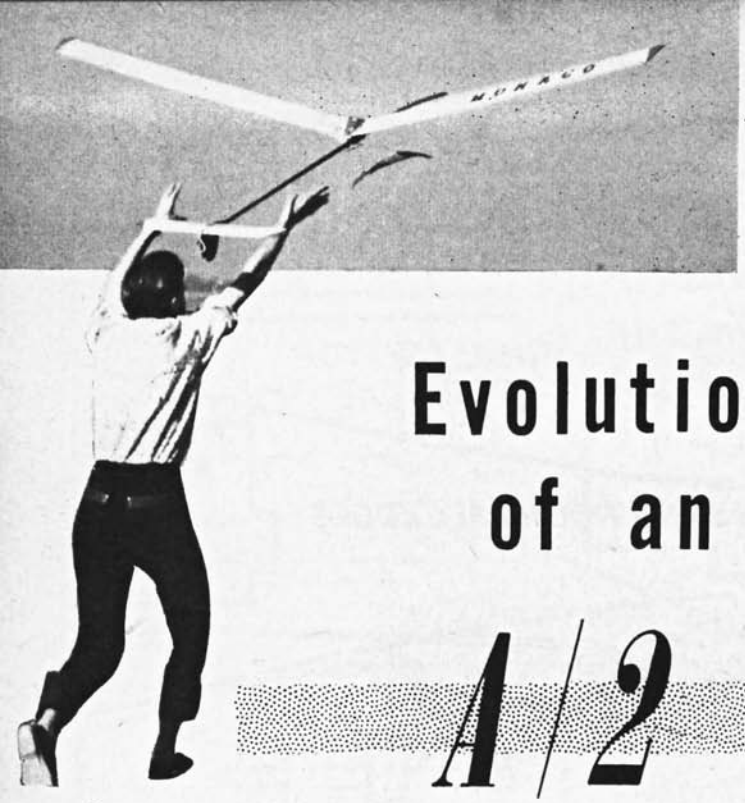
DETAIL OF JOINT AT MAINSPAR AT DIHEDRAL

K. 18

M.A. 289 K.M WEBSTER 4/46

LENGTH 46" SPAN 78"

19 20 NOEL ST. LONDON W1



Evolution of an A/2

by

KARL WEBSTER (Wakefield M.F.C.)

This account of four years' work on an A/2 is not intended to be an authoritative article on Sailplane Design, but simply the result of my experience. No doubt many of the following statements will bring forth groans of anguish and perhaps even sympathetic comments from many quarters, but at least it will show a diversity of ideas, which can only be to the good.—K.W.

THE present line of development began in 1954, with the aim of producing the ideal A/2 for contest work. I came to the conclusion that for a model to be able to keep up a good contest average, it must possess good line stability during a fast tow and also be able to hold its own against slackening off and increases of wind speed, i.e. gusts, whilst on the glide.

The first model in the series, designed with this end in view, featured slim pod and boom fuselage, medium aspect-ratio wing and thin, highly cambered section.

The resulting model was very "Continental" in appearance and brought forth considerable adverse comment, especially from the "Gad Sir! it just isn't English" types, when first seen. Three days later, in the calm evening air on Halton Airfield, the critics were eating their words—on that evening the model averaged 2 min. 51 sec. on 11 flights. The model, together with performance details, is shown in Fig. 1.

After a time I began to notice instability in conditions of wind, this being in the form of bad stall recovery. I came to the conclusion that this was caused by too little longitudinal dihedral or, to put it another way, the angular difference between wing and tail was not sufficient to bring about an adequate stabilising force.

This angle is not a fixed quantity but depends on certain factors, such as wing section and tailplane efficiency. It was this latter point which set me thinking.

The c.g. was at 65 per cent. chord and with a 60 per cent. Clark Y tailplane section, this gave an angle of wing incidence of 2½ per cent. I did not want to bring the c.g. any further forward, nor did I want to change the tailplane area; I felt there was some other way out. I hit on the idea of an undercambered tailplane and this I knew would allow me to increase wing incidence to about 4 deg., ascertained by experimenting with A/1 size jobs with sheet tail surfaces.

Many modellers I have met will not agree with me on this point, and say that high lift sections for tailplanes do not have any effect on the trim of the model. A high lift tailplane is much more efficient than one of thin Clark Y or flat section, and so allows less area to be used.

Some time later I teamed up with A. Farrar who, at that time, was flying a typical English A/2 with a thick section. He was very critical of my type of design but agreed that it had some good points which, if taken further, could provide the ideal contest model.

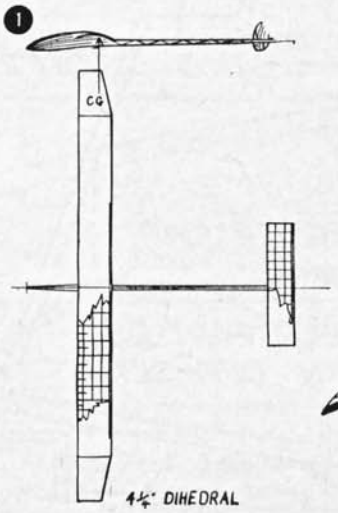
Consequently we set about designing a model utilising the good points of both models and the result is shown in Fig. 2.

It was a slim fuselage model with rather thin wings and medium-long moment arm. I think it can safely be said that one or the other of us gained a first, second or third in every event we entered in 1955. This design also brought forth much criticism and I shall always remember the remarks of the A/2 enthusiasts from Loughborough college: "They might perform well but what happens when it's windy?"

As we had designed the model for windy conditions this remark was, to say the least, discouraging. However, the model seemed to stay in one piece. Its only drawback was the fuselage which, on top of being somewhat difficult to build, had the bad habit of bending

(Continued overleaf)

1



K-4

K-5 was identical apart from having an undercambered tail.

Span 76 inches

Chord 6 inches

Length 50 inches

Tail area 80 sq. inches

Construction hardwood and balsa

The final test . . .


MODEL AIRCRAFT

Surprise Win in A/2 Champs.

is in the competition itself, as this flashback to our December, 1956, issue proves. It will be remembered—probably painfully by most A/2 fliers—that Brems of Belgium won the Individual A/2 title at the 1956 World Champs. with a model that was at complete variance with the accepted layout for a high performance model—which just goes to show . . .

and staying bent (!) thus tending to upset the trim.

The present model is based on this joint effort (known as the *Katoo*) and has merely been simplified and had the fin placed in front of the tail (it's safer there), also I have gone back to undercambered tails which I gave up for a time, mainly for ease of construction.

There is much work yet to be done on the A/2 and it is far from the truth to say that the design of the model sailplane has reached its limit. Much work has yet to be carried out on wing sections and turbulators, and for anyone who is prepared to experiment there is plenty of scope. I have yet to see, or hear, of the three minute A/2, but I have no doubt that this experience is near at hand and may come upon us any time now. Although I am quite sure that if, and when, it does, the F.A.I. will pounce, with drastic effect!

At the moment I am experimenting with anhedral tailplanes and their effect on stability; what the outcome of these tests will be I cannot yet say as I have not had time to draw conclusions.

Structural design is also an excellent field for experiment, as most A/2s seen on our flying fields are much too complicated and too darned expensive: when an A/2 starts to cost over £1 something is amiss.

And here I must add a note for those W.W.I enthusiasts who regard the modern contest model as an eyesore, and don't seem to mind telling everyone. The A/2 sailplane has to fulfil a purpose and in fulfilling that purpose must be good looking. It is designed for the most graceful of all aeronautical movements and therefore must in itself be of graceful design. Please remember that a Sopwith *Pup* was built to "fight" and the fact that it turned out to be a cute little bundle of wood and wire was purely by chance.

Now let us take a look at the latest model in the series and see what we have (see Fig. 3). A simple A/2; no scientific layout. The fuselage, whilst having ample side area for towline stability, is cut down to the minimum, where area is not needed, at the top and bottom. It is in effect a profile (there is no such thing as a "lifting fuselage") and is simply $\frac{1}{8} \times \frac{3}{8}$ in. hard balsa covered with $\frac{3}{32}$ in. sheet.

The wing is of normal construction and is fixed to the fuselage by means of a 4 mm. ply tongue (best birch). Aerofoil is medium-thin own-design based on the Benedek range. The tailplane uses the same section but in this case it is thinned to 80 per cent. Main points about the performance of this model are good stall recovery and an overhead launch every time.

Finally, a few remarks on trimming and flying procedure.

The kind of trim used on an A/2 depends to a great deal on the particular modeller; I myself prefer about 100 ft. circles, and a slow undulating glide which is just off the stall. This trim is obtained by using about 50 ft. of towline and using packing under the tailplane. When the model has a slight stall a small amount of extra rudder is given to damp out any prolonged stalling tendencies. A model trimmed beyond this point is not a good proposition, except in very windy weather, when the turn may need to be increased slightly.

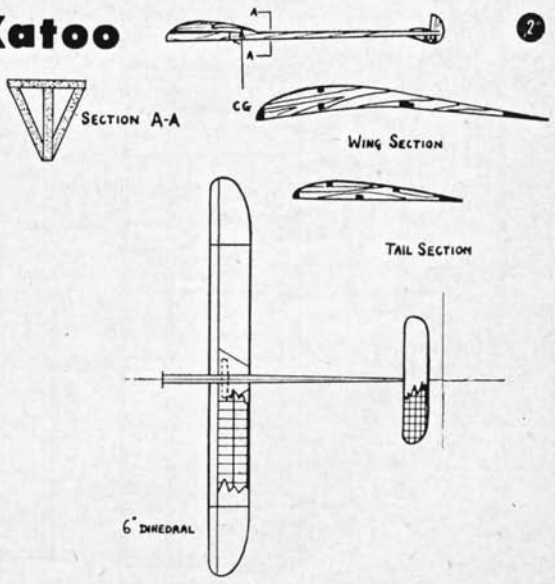
Some time ago I used a timer-operated d/t on a model very similar to the K-4. This set-up worked by means of a wire retainer pin in the rear of the fuselage; this was connected to the timer and passed through a loop of C/L wire fixed to the tailplane trailing edge. On one flight the timer went haywire and did not pull the pin right out of the loop. The tailplane not only became tilted in flight—it also had a decrease in incidence, thereby giving an up elevator effect and increasing the turn.

The resulting flight was quite interesting and afterwards I began to trim the model for a very tight turn. To counteract this turn it was necessary to place $\frac{1}{4}$ in. of packing at the trailing edge of the tail. The model flew with about 45 deg. of bank, and as the turn radius was in the region of 20 ft., it was nearly thermal happy. When using this kind of trim it is also noted that elevation trim is not critical as the model just refuses to stall, but please don't try it the other way—that turn is much too steep to go playing around with trying to make it fly in a groove. If it's thermals you're after, this is the trim, but remember, it's hard on wing tips.

I have also used the so-called wandering trim and found it useless for our kind of weather. This is the trim which needs a very slim toothpick-type model to use

Continued on page 282.

Katoo



Span 64½ inches
Chord 7 inches
Length 50 inches
PERFORMANCE
2 min. 10 sec. approx.

Construction: Balsa throughout