ADS

# ABERDEEN AND DISTRICT SOARERS

Newsletter No.20

7 Ashgrove Road West

Aberdeen

October 1984

## 1984 ANNUAL GENERAL MEETING

This year's AGM will be held on Tuesday 30th October at 7.30pm. The meeting will be held this year at 7, Ashgrove Road West. We had a reasonable turnout of members last year -let's repeat or even exceed that number. By way of an incentive,there should be a number of video films available.

## AGENDA

1. Chairman's report.

2. Treasurer's report

3. Election of new committee. Graham Donaldson whilst not having served the maximum three years on the committee wishes to demit office. a nomination will therefore be required to replace him.

4. Budget for 1985.

5. Competition report.

6. A.O.C.B.

MAKE A NOTE OF THE DATE - 30th October

MAKE A NOTE OF THE PLACE - 7, Ashgrove Road West.

## LOCH INSCH - WATERPLANE FLY-IN

There has been a flurry of activity amongst some of our members over the past few weeks. There was a whisper that gliders were to have floats attatched and be launched from Loch Insch by speedboat! Our wires must have been crossed - the event was for power planes. The only powerboat present was hardly a speedboat - some complained that the rescue boat was far too slow in reaching their sinking models!

Certain of our members who dabble in the power thing decided to join Duncan Cameron and fellow members of B.W.A. (British Waterplane Association) on the weekend of 16/17th September. Hurried attempts to beg borrow or steal aircraft suitable for the event proved fruitless - it was back to the building board. From it emerged a Citabria, a Corkscrew and a Magnatilla all on floats. One Tuesday evening ( what no gliding?) all three models were taken to the Duthie Park pond for taxiing trials. All went well,the floats seemed to be fixed in more or less the correct place and they floated!

About twenty or so modellers were there complete with waterplanes. With great trepidation, twitching fingers and beating heart each of the three models descibed above took to the air from the water and landed again on the water. Certainly the waterborne performance varied, one model in particular thought for a while it was a speedboat as it sped around the lake - the owner shall be nameless Alan.

The photographs (courteousy of Jim Anderson) depict some of the activity. Most felt that the event was well worth while.It was a venture into new realms of modelling and to be recommended to all. Any who are interested in joining the recently formed B.W.A. can get in touch with membership secretary Mike Rimmer at 84,Linaker Street, Southport, Merseyside, PR8 5DG.

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## LEISURE FOR PLEASURE

We understand that this year's Leisure for Pleasure exhibition is not to take place - the Music Hall is in the process of renovation. This is an ideal opportunity to let members of the public see for themselves something of our hobby. Once more it is over to us, the existing members to educate Joe Public.

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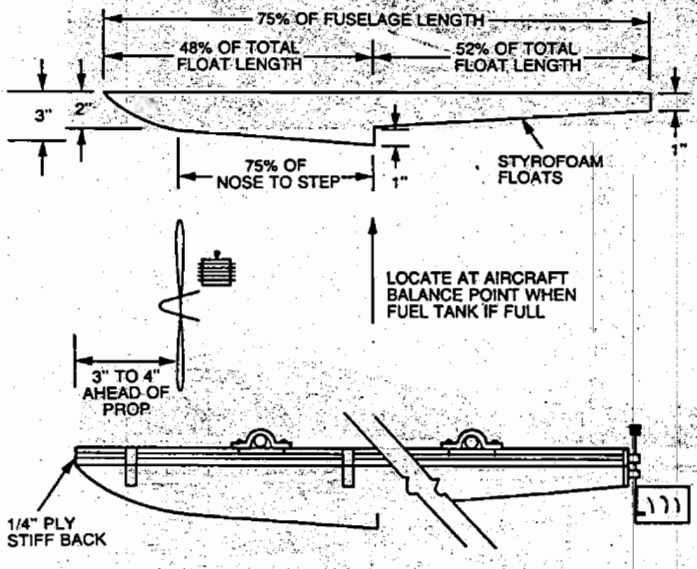
# FLOAT PLANE DESIGN

So you want to try flying from water. Might I first suggest that you select an aircraft that flies well and that you are familiar with. Preferably it should be of low wing loading and have ample power. An aircraft that struggles off the runway will never unstick from water! If in doubt install a more powerful engine. Having selected the aircraft and engine, examine the airframe for possible sources of water ingress (there's no doubt that water will get to the hidden places, but don't make it too easy). If possible protect the electrics. Wrap as much as possible in plastic bags and seal as best that you can. Spray will not do toomuch damage,but one day the plane will take a good dunking.

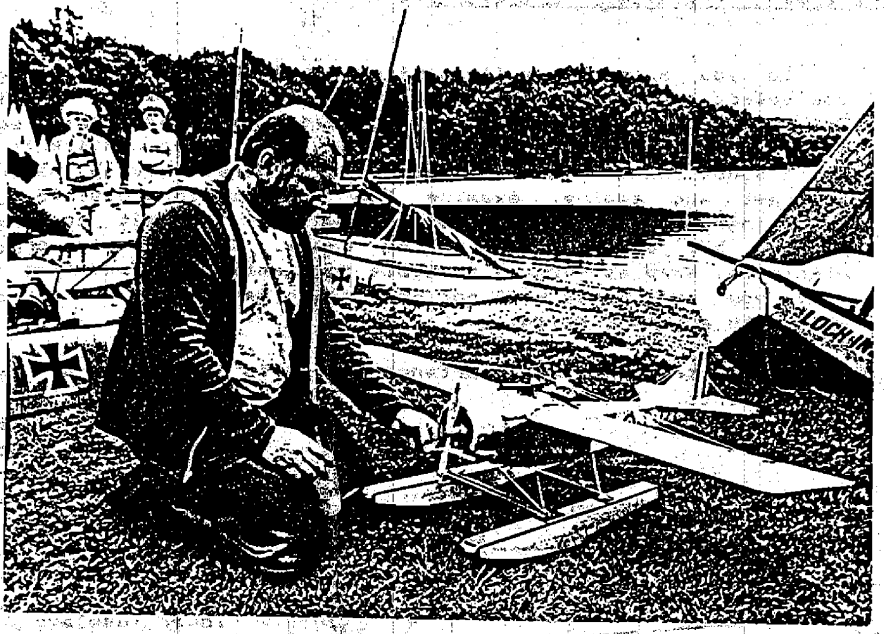
Floats are of prime importance. Below is a sketch of the basic requirements.



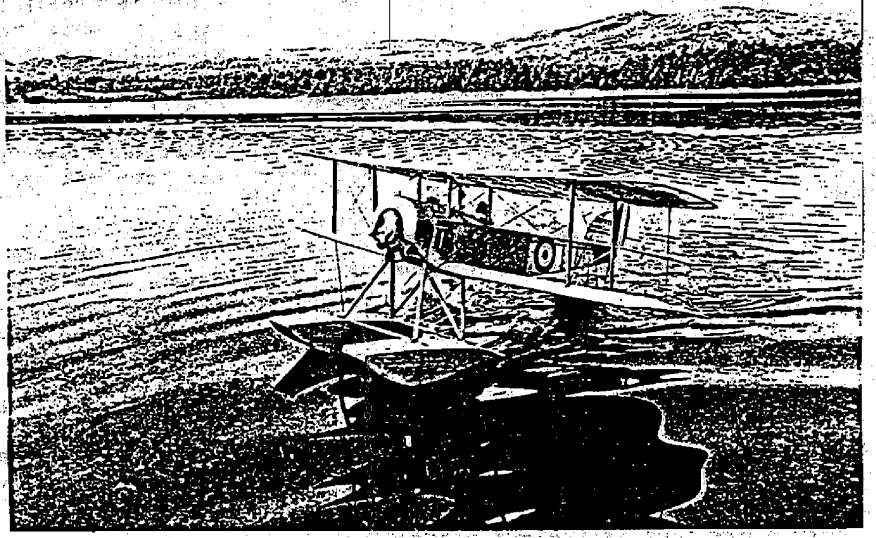

Build as light as possible, but do strengthen the underside. Preferably cover the entire float with glasscloth and epoxy (not as difficult as you would imagine). Fit to the lower fuselage using the undercarriage fixing and a further rearward fixing - some local strengthening may be required. Follow the directions in the sketch and also ensure that the upper surface of the float is parallel to the wing chord or just slightly positive. In the final analysis you may reqire to experiment to obtain the optimum location and incidence for your set up.

**THANKS TO PORTLAND SKY KNIGHTS AND DICK HANSON FOR FLOAT DESIGN**

And so to the water. Start up and with everything set up start by taxiing around. You will find that a water rudder is not necessary. When you have built up sufficient courage, get set for take off. Head into wind, gradually open up the throttle. Correct any lateral movement with the rudder. Leave the elevator alone. Once speed has built up, the plane will lift onto the step and accelerate rapidly. At about this point try a little up elevator and low and behold she'll be in the air. Easy wasn't it! See you at next year's Highland Waterplane Event.



Norrie Kerr and his MAGNATILLA



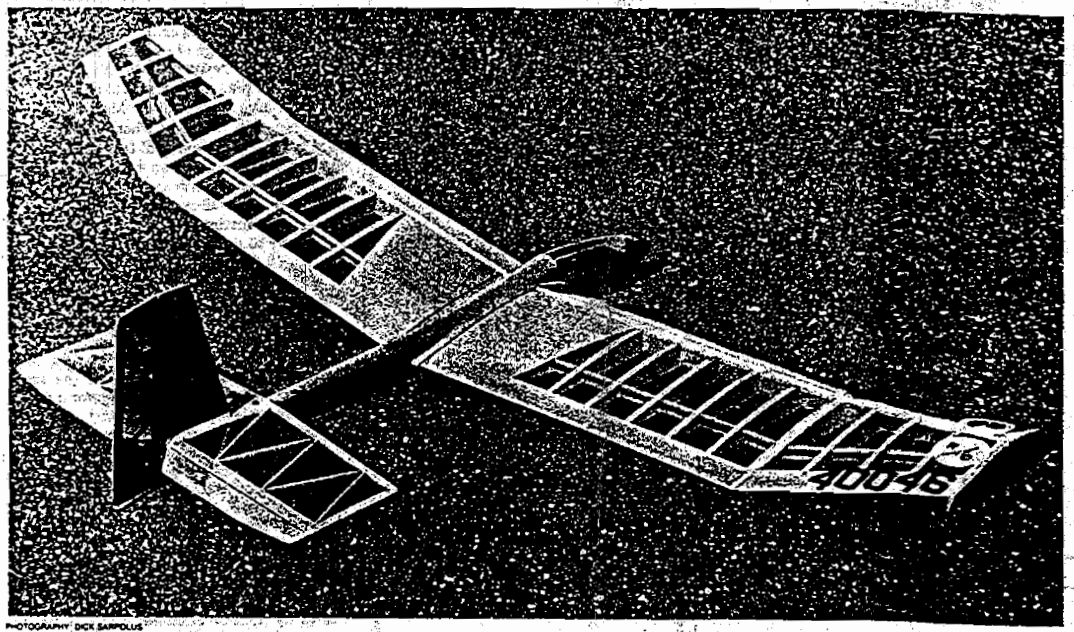
Lou Weaver's 1/5 Scale SOPWORTH BABY

# Low Aspect Ratio Sailplanes:

# Theory

The pros and cons about this departure from common R/C sailplane practice.

**By Herk Stokely**



PHOTOGRAPHY DICK SARPOLUS

A sailplane? Certainly. It's Dick Sarpolus' *LARS*, acronym for Low Aspect Ratio Sailplane, his experiment with non-standard sailplane design.

In the July 1976 issue, FLYING MODELS published a construction article by Dick Sarpolus entitled *LARS* the Low Aspect Ratio Sailplane. Aspect ratio (AR) is the slenderness index of the wings (or any surface). To calculate it, divide the span by the average chord. High aspect ratio is what gives a sailplane its special look. Most R/C sailplanes have AR values of 10 to 15. Manned sailplanes have been built with AR as high as 40.

In his article Dick said what everyone knows: high aspect ratio is more efficient. Then he asked the question for his readers: "why use low aspect ratio on his model". His answer was that he really wasn't sure that high AR is better at model sizes and he built the plane to see if he could really find out. His conclusions were mixed, but he did decide that low aspect ratio models weren't all that bad.

I recently spent the best part of a day with Dick, just talking about everything, but mostly models. Among the many topics we covered was the *LARS* and whether he ever decided if it was better or worse than the more usual sailplane designs. Dick said he still felt both ways about it, but in general he thought that the higher AR models have better and more consistent perfomace.

## Recent development

My interest in the idea developed when a new club member showed up with a copy of Dick's design and began flying it in the two-meter class at our monthly contests. The plane looked like a giant hand launched glider with a particularly homely horizontal tail, but it flew rather well. It's a large plane and since it was flying against the little two-meters it gave a very good accounting of itself. It was especially good at consistently outlaunching them. It did thermal well too, but its performance was sometimes inconsistent.

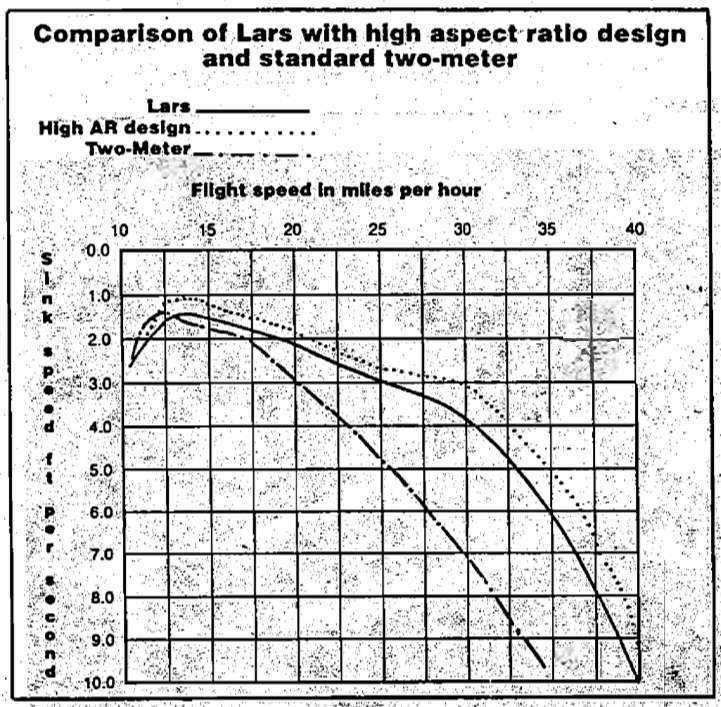
The plane's owner, Mark Kummerow, stopped by one day and we began talking about the idea. Mark thought the design could be improved upon, that it was worth pursuing, and wondered what the computer could tell us about its possibilities. I think that Mark was stung a bit by my comments about the ugly tail. He said that he was considering a new tail, but decided he'd really like to build a new plane. We went to the computer with some of the excellent model airfoil wind tunnel data published by Dieter Althaus and looked at the model sized up slightly to two-meters. The performance looked particularly good with the Wortmann FX 60-100 airfoil, and the next thing I knew Mark had it built and ready to fly. Mark is an excellent designer, and a real craftsman. The plane had a new, very sleek fuselage design, and an attractive all-moving horizontal stab. It still looks like a big handlaunch glider (free flight style) when it's flying, but we've found over the last year that it is a real threat on the contest field. Quoting someone else; "It floats like a butterfly and stings like a bee".

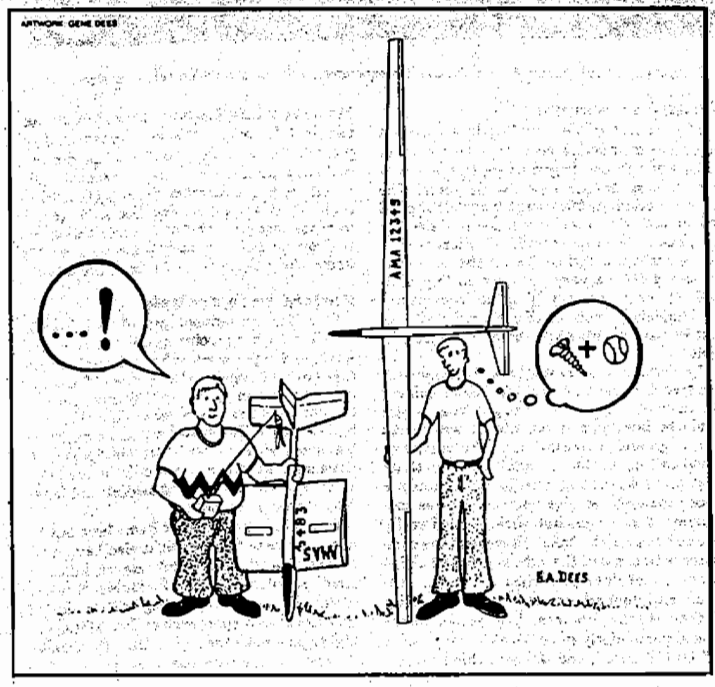
## Performance analysis

Consider the advantages of the *LARS*. Quoting Dick Sarpolus again; "If it would work, such a plane would have several advantages over conventional sailplanes. The wing, having a shorter span, would be stronger and be able to stand heavy winch launches and higher winds. The model would be easier to transport with shorter, wider wing panels. A large amount of wing area could be used in a short span for lighter wing loading and hopefully better performance."

Dick left out a couple of items here but he had the heart of it. He might also have mentioned that the real performance killer in small sailplanes is low Reynolds Number (R.N.). If you are operating with a design that has a fixed span, such as Two-Meter, the higher you make the aspect ratio, the smaller the chord of the wing has to be. You also lose

# Low Aspect Ratio Sailplanes: Theory




area when you increase AR on a fixed span. Small chords on thermal models result in big losses in performance because of the poor airflow at low R.N. Dick's idea takes it the other way. We're talking about a 14 inch chord here. That's big on any model, and huge on a two-meter. With the large chord of the *LARS*, the R.N. is much higher and may even offset the losses caused by aspect ratio. Another advantage of the *LARS* may be it's biggest asset—responsive handling. The roll response to pilot control input really goes to pot with high aspect ratios. Most of our designs are past the point where things begin to get bad. In fact many of the thermal soaring designs I've flown do not handle well at all. This plane however is a whole new experience after the "full-rudder and wait" kind of flying we sometimes get used to. The words that come to me are "lively, dancing, responsive, quick," and several more that also don't do it justice.

Well, what did the computer show us? The chart shows three sailplane sink rate polars. First, they compare the *LARS* with an identical plane except that its wing has been stretched and narrowed (keeping the same area) until the aspect ratio is high for a model (13). Second is a comparison with a typical popular two-meter design of the type that it is likely to be in competition with. I did a column on sailplane polars a few months back, but if you're not used to looking at these, just study them for a few minutes, and most of what they have to tell will become clear.

The theoretical predicted performance of the model is not nearly as good as its high AR brother. Mark will tell you that too. If he has to fly against unlimited class sailplanes on a good day he will choose his *Sailaire*, not the *Searcher 2M*. That means, for a plane with the wing area of the *LARS*, the gains in Reynolds Number effects with the large chord, does not offset the losses due to the low aspect ratio. Compare it with an average two-meter design however, and now there is a big difference. First, its sinking performance is just as good, and the area of best performance extends over a much wider speed range. That means it can penetrate better without sinking and it will have a much higher glide ratio because of it. Of course the theoretical charts only show straight-ahead, no wind conditions, and aren't able to predict what happens when we circle and maneuver. This is the area where the *Searcher 2M* comes to life. I've flown the plane several times myself, and I know that its real-life performance is better than the computer predicts: *much better.* Making high AR planes turn is a big job, and control inputs mean drag. Also, in circling with high AR, the inner wing is really moving much slower than the outer, needing quite a bit of control, thus drag, to offset the difference in lift. Finally, maneuvering in turbulence near the ground is where the best characteristic of low AR is plain to everyone. It's hard to keep those long wings level and out of the grass in the final seconds of going for your landing bonus points. The *Searcher 2M* is at its best here with short wings and

instant response under the worst of conditions. Look back to where I said Mark would choose his *Sailaire*. Notice that I said "on a good day". Contest weather is sometimes not so good, and on those days Mark flys his giant 2-meter against the unlimiteds too. It is a really good feeling to know that you have a plane you can fly under almost any weather conditions.

I mentioned the launching capability of this model earlier. It is notable enough to give it a special mention here. Mark has designed this to be a very strong plane, and its launches on a strong FAI type winch are breathtaking. The plane takes full power zoom launches without any sign of weakness. At one time Mark did fold one half of the stab on a launch—but no damage to the wing. The stab design has since been strengthened. (Lessons learned department) Actually the plane flew pretty well with the broken stab.

### Notes on flying

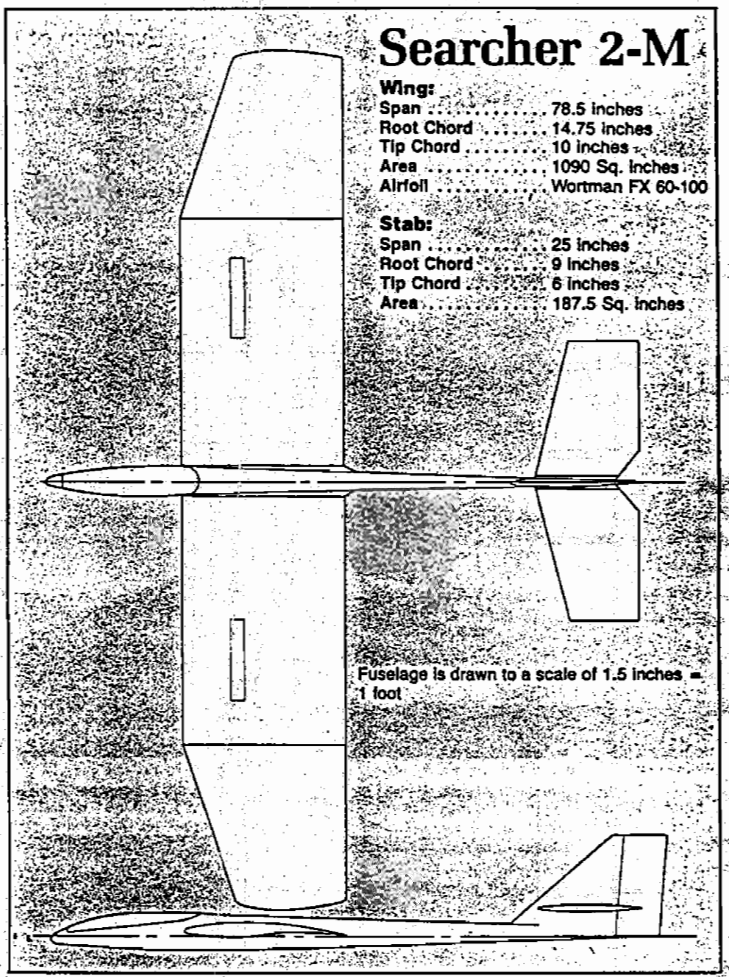
Flying a *LARS* has some differences to it. Some understanding of these things will help get the best out of the model. On a wing in flight, the lift forces tend to move around quite a bit as the plane changes speed. On a *LARS* there is a lot more chord to move on, and the effects are much more noticeable than they are on a plane with more usual chords. At higher speeds, the center of action of the lift forces move back on the wing, sometimes almost to the trailing edge. This makes the plane want to pick up a nose down tendency as it gains speed. The low AR also tends to concentrate all of the downwash that the wing develops at high lift, and that concentration is focused in the area of the horizontal stab making the plane less stable in pitch.

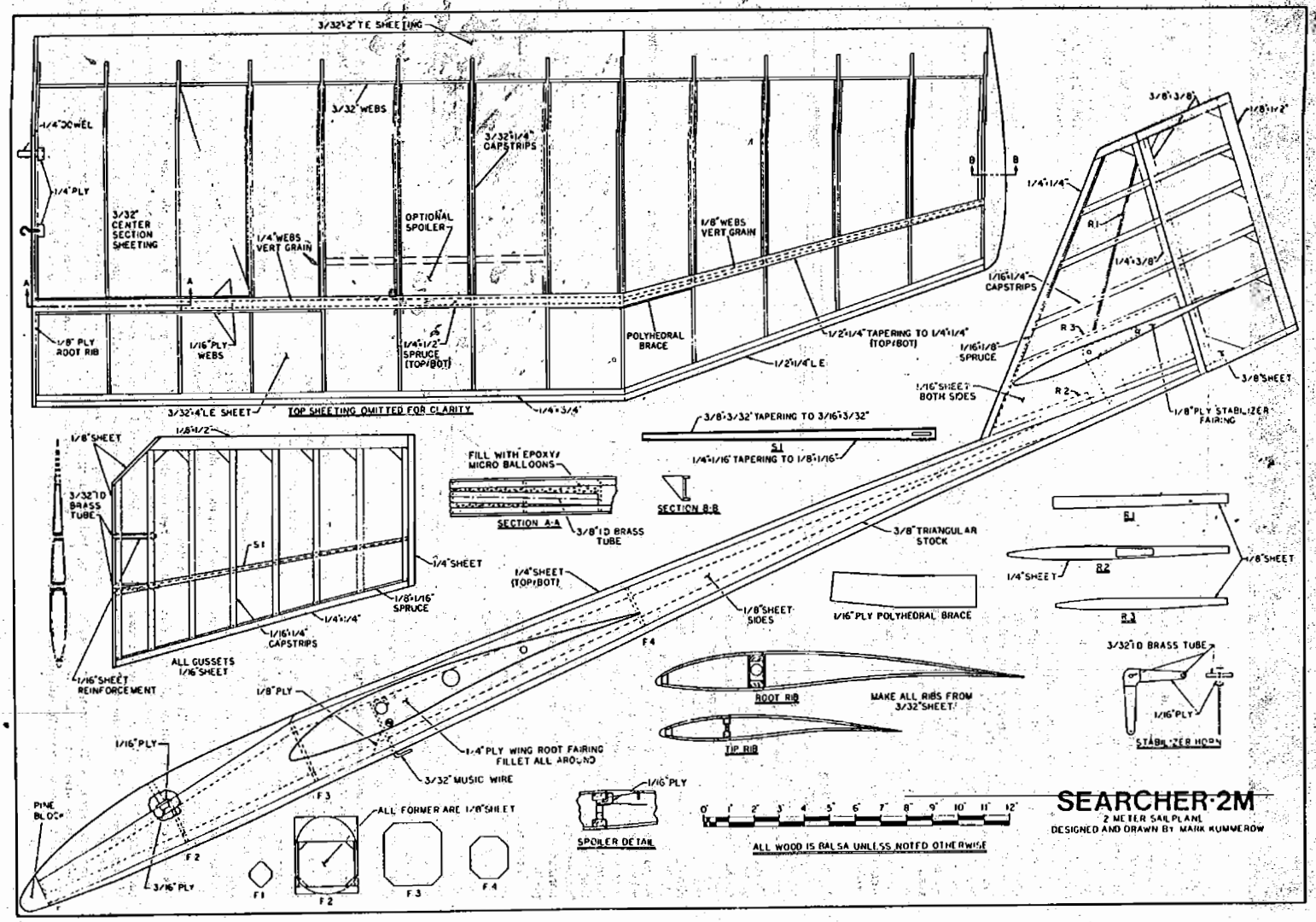
To control these tendencies, the plane must have a larger than usual horizontal stab. Don't think you can get by with that skimpy 10% thing you put on your ASW 20 look-alike. To fly well, the stab has to do a lot of work and the trouble of building it with a real airfoil is worth the effort. You will also have to balance the plane with the CG further forward than you're used to on more conventional designs. I know that a lot of sailplane fliers like to balance their models right on the ragged edge of instability, *and they're proud of it.* Do that to this model and you'll find yourself flying a real can of snakes. Adding nose weight to a model that tends to tuck-under at high speed doesn't make much sense to most people, but that *is* the solution to the problem. It really has to do with the trim position of the horizontal stab in normal flight. Moving the CG forward causes a trim change so that you have to reset the stab with its leading edge lower. This kind of trim has been called "longitudinal dihedral", but whatever you call it, the effect is to cure the tuck-unders. Mark's plane is steady as a rock at high speed, but it took the right CG location to get there.

Do install spoilers. This model has a really excellent glide ratio and it is hard to get it on the ground where you want it. Adding to this is the ground effect, where the air is squeezed between those wide wings and the earth below. It has the effect of increasing the effective AR and making the glide ratio even better. Mark originally built the model without spoilers, but it wasn't long before they appeared.

One other item as I wrap this up. Look at the glide polar, and you'll see that the *LARS* goes to pot as you slow it down. The conventional designs do pretty well almost down to the stall but *LARS* comes down like a parachute when you slow it too much. High aspect ratio minimizes induced drag (that is drag due to lift). Induced drag increases with the square of lift coefficient, so a little increase in lift makes a big increase in induced drag. Induced drag is the "Achilles heel" of the *LARS*. Its good performance comes from other factors, and for its best performance you have to avoid high lift coefficients—in other words—high angle of attack. You can use this characteristic to help if you know about it. Fly the plane faster than usual for best performance, but when you're on landing final, slow it way down and it comes in steep and slow like a STOL airplane.

Will *LARS* replace conventional sailplane designs? Probably not, but it is a killer under some conditions, and it's a delight to fly. For two-meter, it may be the answer. Mark is still exploring the idea further. He has built a very cute and fun-to-fly *One-Meter* R/C hand-launch version, and he recently showed me plans for the same plane scaled up to FAI maximum. That puts over 2000 square inches of wing area into a span less than 110 inches. I don't know if he'll build it, but if he does, I sure want to be there when it flies.




3/32"x2" TE SHEETING
1/4"x30"WEL
1/4"PLY
3/32" CENTER SECTION SHEETING
3/32" WEBS
3/32"x1/4" CAPSTRIPS
OPTIONAL SPOILER
1/4" WEBS VERT GRAIN
1/8" WEBS VERT GRAIN
1/8" PLY ROOT RIB
1/16" PLY WEBS
1/4"x1/2" SPRUCE (TOP/BOT)
POLYHEDRAL BRACE
1/2"x1/4" TAPERING TO 1/4"x1/4" (TOP/BOT)
1/2"x1/4" L.E.
3/32"x4" L.E. SHEET
TOP SHEETING OMITTED FOR CLARITY
1/4"x3/4"
3/8"x3/8"
1/8"x1/2"
1/4"x1/4"
R1
1/4"x3/8"
1/16"x1/4" CAPSTRIPS
R3
1/16"x1/8" SPRUCE
1/16" SHEET BOTH SIDES
R2
3/8" SHEET
1/8" PLY STABILIZER FAIRING
1/8" SHEET
1/8"x1/2"
3/32" ID BRASS TUBE
S1
1/4" SHEET
1/8"x1/16" SPRUCE
1/4"x1/4"
1/16"x1/4" CAPSTRIPS
ALL GUSSETS 1/16" SHEET
1/16" SHEET REINFORCEMENT
3/8"x3/32" TAPERING TO 3/16"x3/32"
1/4"x1/16" TAPERING TO 1/8"x1/16"
FILL WITH EPOXY/ MICRO BALLOONS
SECTION A-A
3/8" ID BRASS TUBE
SECTION B-B
3/8" TRIANGULAR STOCK
1/4" SHEET (TOP/BOT)
1/8" SHEET SIDES
1/16" PLY POLYHEDRAL BRACE
F4
R1
R2
R3
1/4" SHEET
1/8" SHEET
3/32" ID BRASS TUBE
1/16" PLY
STABILIZER HORN
ROOT RIB
MAKE ALL RIBS FROM 3/32" SHEET
TIP RIB
1/8" PLY
1/16" PLY
1/4" PLY WING ROOT FAIRING FILLET ALL AROUND
3/32" MUSIC WIRE
F3
PINE BLOCK
F2
3/16" PLY
ALL FORMER ARE 1/8" SHEET
F1
F2
F3
F4
1/16" PLY
SPOILER DETAIL
0 1 2 3 4 5 6 7 8 9 10 11 12
ALL WOOD IS BALSA UNLESS NOTED OTHERWISE
SEARCHER-2M
2 METER SAILPLANE
DESIGNED AND DRAWN BY MARK RUMMEROW