THE

SCATER

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ARE YOU THEORY LEERY?

In this issue we have an interesting letter from Peter Wanngard of Stockholm, Sweden. Pete has some things to kick around concerning stab sections. But before you read Pete's letter I would like to make a few long winded comments on the appreciation of discourses of this sort. As many of us recognize, there tends to be a general misunderstanding between the "brute force" modellers and the "theoreticians". This misunderstanding results in a lot of heated arguments as to the relative usefulness of any "theory". On the one side the "practical" boys approach all theory with a chip on their shoulder. They are looking for evidence that this complicated theory stuff is unreliable, unpredictable, impossible to use and sometimes just plain wrong. The critics pick away at every assumption, extrapolation, observation, etc., to "prove" that the theorist doesn't know what he is talking about.

Unfortunately there are some writers around pushing this theory bit who might deserve some rebuke. You have to watch out for them.

On the other hand when someone like Peter comes along and makes an honest effort to discuss something that he has found to be interesting, we should pay attention. To get full enjoyment from the theory boys there are a few ground rules to follow.

(1) Don't be over-awed and expect a more precise solution than is really being offered.
(2) Remember that the writer does this as part of his hobby. He gets enjoyment out of analyzing a problem even if a solution is not forthcoming.
(3) The theorist likes to bubble along postulating this, assuming that, observing something else, ignoring trivia. All this is very unnerving to one who clings to the straws of modelling's "old wives tales" school of design.
(4) The theorist doesn't really take himself as seriously as many people think. He rambles along but usually recognizes the limitations of his own theory.

The biggest problem is one of communication. It is difficult for the theorist and "layman" to get together and reach a common understanding.

One of the objectives of the "Scatter" is to break down this barrier and get everybody busily creating ever more efficient and reliable airframes.

In other words don't expect dissertations like this of Pete's to give the magical solution. Rather, it is an exercise in the combining of basic theory, assumptions, observations, experiment, and yes, opinion. It carries with it all of the possible errors of each part which may multiply or, depending on the skill of the designer, may tend to cancel and zero in on a solution. Send us more, everybody.

LETTER FROM STOCKHOLM (Peter Wanngard)

"Thank you for the Christmas card and for "Scatter", the best contest free flight publication I have ever read. I wrote to you some months ago on stab sections. I hope you have not published it yet, as I am so terribly occupied by studies and homework I see much to my sorrow that it is almost impossible to find time for writing technical articles. So for now I can only give a very brief account.

On stab sections and rate of sink.

Hacklinger showed that for a given stab section and model you have an optimum stab C_L which gives the lowest V sink. He showed that this stab C_L opt. is a function of wing and stab aspect ratios and (I think) the wing C_L. This is also done in an unpublished Göttingen report. Thus it would not appear as generally stated that the further back the CG the lower the sinking speed.

Generally, lowest sinking speed is achieved with a small area stab of symmetrical section flown at $C_L = 0$. For a given C.G. location the static stability increases with the lift gradient of the stab as the static margin is then increased as pointed out by Dave Bevan's formula in the August "Scatter". Thus the highly cambered, thin and flapped stab sections give better static stability and higher rate of sink even if flown at C_D min.

On stabilizing effect (importance of high C_L max.)

Static longitudinal stability is unimportant compared to the dynamic variety. Static stability implies equilibrium of moments only, which can always be obtained (e.g. by moving the c.g.) thus static stability is not interesting from an "aerodynamic" point of view. What plays the great part is the dynamic stability which to a great extent is a matter of damping effects. Compared to static equilibrium, damping effects are not easy to obtain, and it may happen that a model is statically stable and dynamically unstable. We thus conclude that the static margin and "neutral point theory" is of smaller value than generally realized.

What in my opinion should be studied is the "phugoid" oscillations and the influence of wing and stab C_L, tail moments and CG. Investigations and calculations of phugoids has a certain similarity to the theory of damped oscillations of the classical mechanics. Applied to model planes, they will lead to systems of differential equations which cannot be solved. Another approach could be attempted using numerical analysis. (Thomann has once tried.

A thought experiment

The reader can do some thought experiments on the influence of two

different combinations on damping effects: Is it better to use a modestly cambered tail section and forward C.G. location or a highly cambered tail section and aft C.G? Assume that we have the same static margin and disregard the moments of inertia and the effects on rolling moments etc. Keep also in mind that the model can assume higher angles of attack than the stall angle if the disturbance is strong enough.

First look at the problem from the standpoint of dynamic longitudinal stability. Then see the problem from the sinking speed point of view.

Of course it is impossible to find correct answers in every case but with some thought perhaps one can see a little the influence of some of the factors."

Pete threw in a P.S.; "As to your writing on the "fresh line", I am quite convinced that the normal layout is the ultimate. At least it's better than flying wings, canards, end plates, etc."

I think most of us will agree that the key to better performance, is the mastery of dynamic longitudinal stability. Pete has looked at this problem on the basis of the section characteristics. What about plan-form effects? Asymmetric rolling moments? Let's hear some more about this.

ONE UPMANSHIP DEPT.

John Sheppard's (New Zealand) 130" span Nordic with 3-1/2" chord. Yipes! When are the writers for the trades papers going to stop calling 7 a "moderately high" aspect ratio?

GOTTINGEN 342

Several people have asked me for the ordinates of the Gött. 342 airfoil. This section first came to attention in an article by Dr. Alexander M. Lippisch in Air Trails April and May 1950 issues. Dr. Lippisch discussed the importance and the method of applying the Reynolds similarity parameter. He then discussed some of the results obtained at the Prandtl Institute at Göettingen, Germany, during WW I. Reynolds number of the tests were in the model range (70,000 to 100,000). Methods of selecting optimum airfoils were discussed and some recommendations were made. Also an example is given for calculating the performance of a glider. Lots of meat here and easy to understand.

The Götts 123 and 342 are shown to be very similar and gave the best L/D absolute of all in the report.

Unfortunately it is impossible to go back and check the original data for accuracy and correctness. For instance the turbulence level of the test is unknown and we now know that it is very important to test at the correct turbulence level. Otherwise the laminar boundary layer development normally associated with low model type Reynolds numbers might be tripped prematurely to turbulent by the tunnel turbulence.

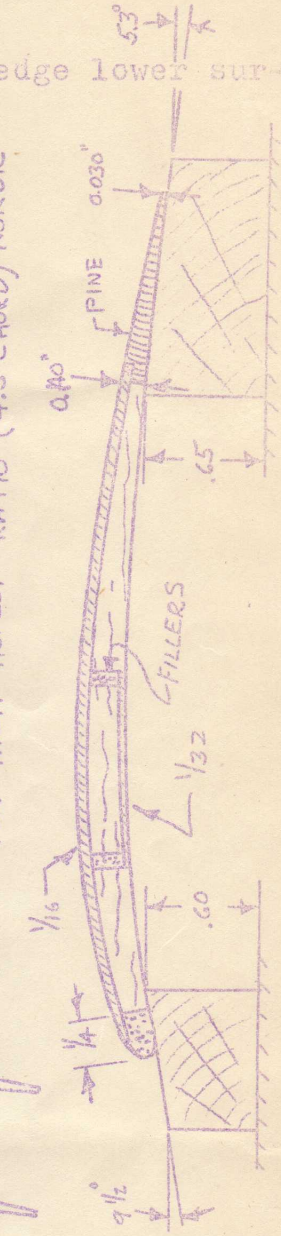
As long as these precautions are understood there is no reason not to

accept some of these data, as at least a starting point to try out some of these sections. I have been using the 342 and 123 since 1951 for all sorts of models and have gotten good results. The 123 seems to work better for power models since it gives a smoother climb. The 342 gives a little slower glide and so works out better for Nordics. If you haven't been using thin sections it might take a while to get used to them structurally, butit can be done.

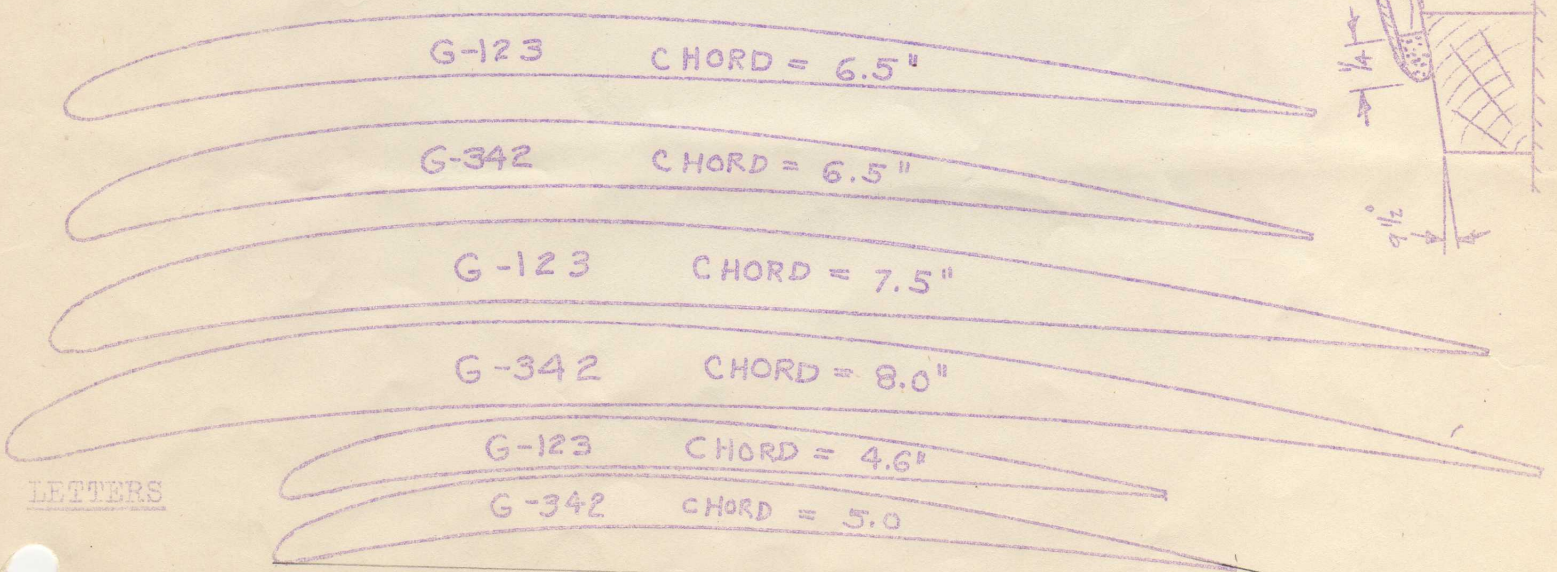
Points to be careful of; leading edge radius and trailing edge lower surface angle. Try to make these accurate.

	Gött 123		Gött 342	
% station	% L'W'R'	U'P'R'	% L'W'R'	U'P'R'
0	1.0	1.0	0.8	0.8
1.25	0.1	2.8	0.0	2.8
2.50	0.2	3.6	0.2	3.7
5.0	0.6	4.9	0.8	4.9
7.5	1.1	5.8	1.2	5.8
10	1.6	6.6	1.7	6.5
15	2.4	7.7	2.4	7.7
20	2.8	8.4	3.1	8.5
25	3.2	8.8	3.5	9.0
30	3.6	9.0	3.9	9.1
40	3.6	9.0	4.2	9.2
50	3.2	8.5	4.0	8.9
60	2.6	7.6	3.7	8.1
70	2.0	6.2	3.3	6.6
80	1.3	4.4	2.4	4.8
90	0.7	2.3	1.3	2.7
100	0.0	0.2	0.0	0.3
L.E. Radius	0.8		0.7	

I BUILD ON WOOD STRIPS NAILED TO BENCH AND SHIMMED UP TO BE LEVEL. OTHERS HAVE BENT PLYWOOD OVER FORMS SHAPED TO UNDERCAMBER.



G-342 TYPICAL CONSTRUCTION FOR HIGH ASPECT RATIO (4.5"CHORD) NORDIC



LETTERS

Norm Ingersoll, North Ogden, Utah. "First of all, let me say that I appreciate your kind remarks regarding my Nordic victory at Fresno. I do not take my team position lightly and will make every attempt to do well at the finals.

Since returning from the semi's life has been mostly work and little play. However, in the time I have been able to spend in the field I have concentrated on my weaknesses rather than my stronger points (i.e., attempting to develop techniques to get out of downdrafts on tow safely, etc.). At this time I have nothing to contribute in the way of plans for next year, etc., but will be in a better position to "report in" sometime after the first of the year if you are still interested. (Ed.: Yes.)

Capt. Frank Mock USAF (Greece). "A $3.98 Cox .020 costs $13.00 here in Greece. I have found a Greek Sgt. who has built models before. Have furnished him with material to build a Jetstream A-1. It is nearing completion and the workmanship is above average. I have an FAI ship under way, the wing and stab will be of the Texan FAI-ton variety with my fuselage. Have a class A bird that needs a wing. Will get to that soon. May use a Lucky Lindy wing just for kicks. It has that type rib in stab. I am trying to locate the old style Torp 29 and 32 (3 screw radial mount). Anyone know where some good ones can be found?"

Bill Blake, Norman, Oklahoma. "Walt Schroder was kind enough to send me your (John Wordin) comments on my recent article on turbulators in the April 1963 M.A.N.

Thank you for your thoughtful comments. I will try to answer your questions. 1) Coordinates: The G610B was 8% thick. The coordinates for this popular section have been published many times. Same goes for the 6409. The Jedelsky section was made as per Ritz's article a few months back in M.A.N. The "HLG" sections were not plotted, but were carved by conventional technique. The other sections used, some not illustrated in the article, were all taken from coordinates from various model publications. The Clark Y was 12% thick, other sections were 8 and 10%. The Triangles: We devised a simple nomenclature for these, T830, for instance means a 8% thick triangle with the high point at 30% of chord. We tested 820, 825, 830, 835, 840, 850. Suggest you not stray far from 830. I have had some very good gliders with triangular sections, but when I tried to use it on a larger (about 250 sq. in.) rubber model, and a 175 sq. in. Jetex, it flopped. In wind tunnels, the section is inferior to nearly anything, except at times, a fine and fortunate combination of angle and speed is struck, at which the section is very good. It is my opinion that on something as small and slow as a HLG, the T830 is about as good as anything, but in larger, or faster planes, no.

Some of the sections were not plotted at all, but were "Ramrod", etc.

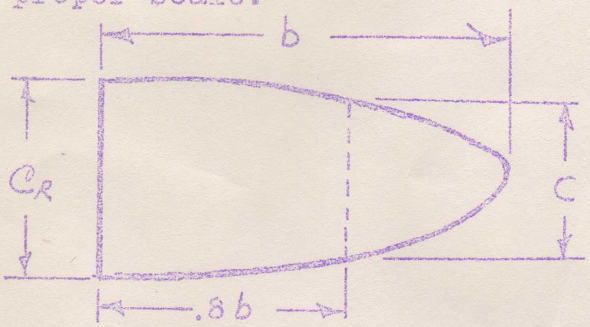
Question 2) Where were the turbulators placed. All over. The vagueness in the article was deliberate. The reason is that the position and size of the turbulators, for practical purposes, is not as tricky as one might think. Ordinary 8-10 lb. test nylon multistrand towline works well, and so does "button and carpet thread" from Woolworths. Furthermore, the exact size and position for the very best performance would vary on any given airfoil, with small changes in speed, angle of attack, temperature, atmospheric pressure, and some other smaller variables. Therefore, it would be silly to report "for a N.A.C.A. 6409, place a0.35729 mm. chord 5.20943 and 31.09876% of the chord. Another important point: on models, one man's 6409 is another man's something else. Some sag between ribs, behind the leading edge, etc., and there you have a different airfoil.

#3. "Same section as in A". I couldn't find "A" either, but assumed it to be the first picture, just above the one at 4 degrees.

The article was a summary of a great deal of testing with many airfoils. We stated only what we felt sure about, and left unsaid a great deal that we felt was not well enough documented. One point that I felt made the study really worthwhile, was that we used model sections, and used conventional construction method, as I felt results would be more valid than if very exacting and "perfect" sections were used, as in full scale research. For example, the G610B was made 1) fully sheeted, 2) upper third sheeted, 3) multispar, 4) no spars protruding, and no sheet as on the zipper, and two or three other variations that I don't remember."

Bill Bogard, Westerville, Ohio. "In Frank Zaic's 1959-61 Yearbook, Ray Harlan on Page 206 discusses "Parabolic" Indoor Planforms. He proves mathematically that the outline drawn tangent to a series of line segments is not an ellipse and contains much more area than an ellipse. I found this hard to believe although the treatment seemed rigorous. So, I laid out a rectangle, put in the equal points on the upper and right edges, connected the proper lines and drew the curve tangent to the lines as I had done for many years thinking I had an ellipse. Using the same rectangle I laid out an ellipse graphically and much to my surprise, there was a definite difference.

I have processed many a wing and always regarded rounded tips as some form of ellipse. However, I have now found how to determine easily whether the tip is elliptical or not. Consider the drawing below which is hand drawn and not to proper scale:



Consider this as a true view. The root chord is C_r and the span is b. Find the chord C at 80% span position. For an ellipse this chord will be 60% of C_r. For a parabelic planform, this chord will be 69% of C_r. Hence the factor for finding the area differs -- ellipse is .7854 and parabelic is .833.

This simple measurement will quickly tell whether or not those tips are elliptical."

POSTAL CONTEST

First report comes from Stevenage, England, by way of Geoff Dallimer.

"Many thanks for your most interesting letter - we felt we were right on the field flying with you! Only thing about it was that our lads saw your scores before they flew and this really had us beat before we started! I think some of them just gave up trying! As you will gather in due course this end of the contest was a bit of a fiasco, to start off with we had to postpone from the first date as there was an impossible wind blowing all day- 2 mins right across the airfield into the building blocks and hangers - most people didn't even get their models out of their boxes. And I don't blame them!

So we rearranged the event to co-incide with our second Area meeting on April 28th when the airfield at Henlow was again available. We had spare men in A/2 and Wakefield but the bare number for Power, as it happened the two "reserves" put up better scores than the team members - but that's the way it goes! The line up was:

Wakefield
Mike Harris XL 59 virtually as the plan plus 14 strands Dunlop.
Alan Payne O/D model (See photo) 22" X 22" prop. 14 strands Dunlop.
Geoff Dallimer O/D model similar to Drapers 1958 model (As flown last year)

Power
Bernie Mack Lucky Lindy, slightly modified dihedral, ETA 15 8" X 4" prop.
Pete Giggle Wood Worm - a brand new model for TD 090 high A/R wing.
Geoff Dallimer Lucky Lindy, standard with ETA 15 now three years old.

A/2 Nordic
Johnny Brookes 'Sceptic' (My 7" chord rough weather A/2)
Pete Giggle 'Wooden Top' an all sheet 'Giggle' design with usual underfin.
Geoff You know who - 'Sceptre' as per the plan, plus a few new warps.

The weather. Well this was most peculiar, on the face of it, it appeared to be a perfect day for flying - very little wind, about 400-500 yeards drift for a max, fairly warm, about 54°, but completely overcast from horizon to horizon, the sun not coming through all day. As I said it seemed to be a great day for flying - the best we have had this (or last?) year--and yet it was terribly difficult to do a max! Looking back on it after having spoken to Ronnie Moulton on the phone, we seemed to have been in the centre of one of those twirls on the weather map, at Watford only 25 miles away Ron had bright sunshine and plenty of bumps all day. At Henlow it seemed to be general sink with occasional weak lift - certainly no models gained any height when they did do a max, generally just about holding their own. Was the air too stable? Could be but this would be most unusual for this country!

Well now after the excuses, to the flying, and I should say that the Area organization is such that we couldn't fly in rounds, a pity. As I had 15 flights to get in I thought it as well to start early - if one can call 10:30 am early! After I had made two flights the other lads were most reluctant to fly! My Wakefield was in very good trim and with a hot motor got to more than enough height for a max., but as you can see was down again in 1.28 and 1.33! Meanwhile the full size gliders we share the field with were just making a circuit of 2000 ft of towline, so we sat around awhile, and I trimmed out my new FAI job for TD 15 (not used in the contest - has cutoff troubles).

When we resumed flying about 1 o/c for a period of about an hour there were several max's recorded, but afterwards it was dead again. I should say at this point that we were particularly anxious to do well in Power as this was an event counting towards the National Club Championship.

Pete Giggle had his new TD 09 job going pretty well, the V.I.T. and Auto-rudder showing up well and easing the trimming problems, however, on his second flight he ran out of fuel after 5 secs, stalled down and seemed to upset the trim somewhere. Bernie Mack's Lindy was getting up high - that's a good ETA he has there - but fell out of the sky on his last flight, stalling all the way down. My Lindy was going about the same as usual - was doing 3.30 at 9.0pm at Friday's trimming session - but two flights of 1.52 don't help ones score!

I finally got a max from the Wakefield and then folded the wing up making a 'javelin' throw to get a bit more height, looped in the reserve and broke a prop., repaired it and then it didn't fold when I did get away for the flight. Alan Payne had even worse troubles, he stalled down on his first flight and crushed the noseblock of his Wakefield, he flew the reserve to two max's and then had a motor break that again smashed a prop. Mike Harris was trimming his XL 59 and never got it going well. (ED.: Good Lord!)

There's very little to be said about A/2, it was impossible to predict lift - at least for me anyway - just had to tow to the top and hope! Maybe an electronic 'Thermal Sniffer' would have helped ! None of the models flown are capable of much over 2.oo mins without lift when trimmed for 'normal' conditions.

As I said before it was all very disappointing, but even so we really enjoyed our days flying and there is considerable interest in these Postal contests. We must congratulate all the SCAT team on the very high standard they all achieved - a wonderful effort for one club. Perhaps one of these days we will be able to match your standard, in the meantime we'll just keep trying! I haven't heard from the Upper Hutt team so presume they didn't fly, Bill McGarvey was hoping to fly for us but at the last minute couldn't - he was quite taken by the idea of flying against Bill Cook and Co!"

FAI LANDER - VAL URE, MANITOBA, CANADA

Val's latest FAI power job looks a lot like a Dixie Lander, which Val is the first to admit. Look closer though and you will see plenty of different ideas. And besides, there are a lot worse airplanes than the Dixie Lander. Val had a lot of interesting notes about this ship but Ye Stupide Editore has lost the lettor. All I can remember is the NACA 3406 wing, 9/1 aspect ratio, big stab (156 sq.inches), 100% CG and high pylon. Sorry Val, send some more. We have known Val since the 58' Nats and have always been impressed by his friendliness and his perpetual interest in new ideas.

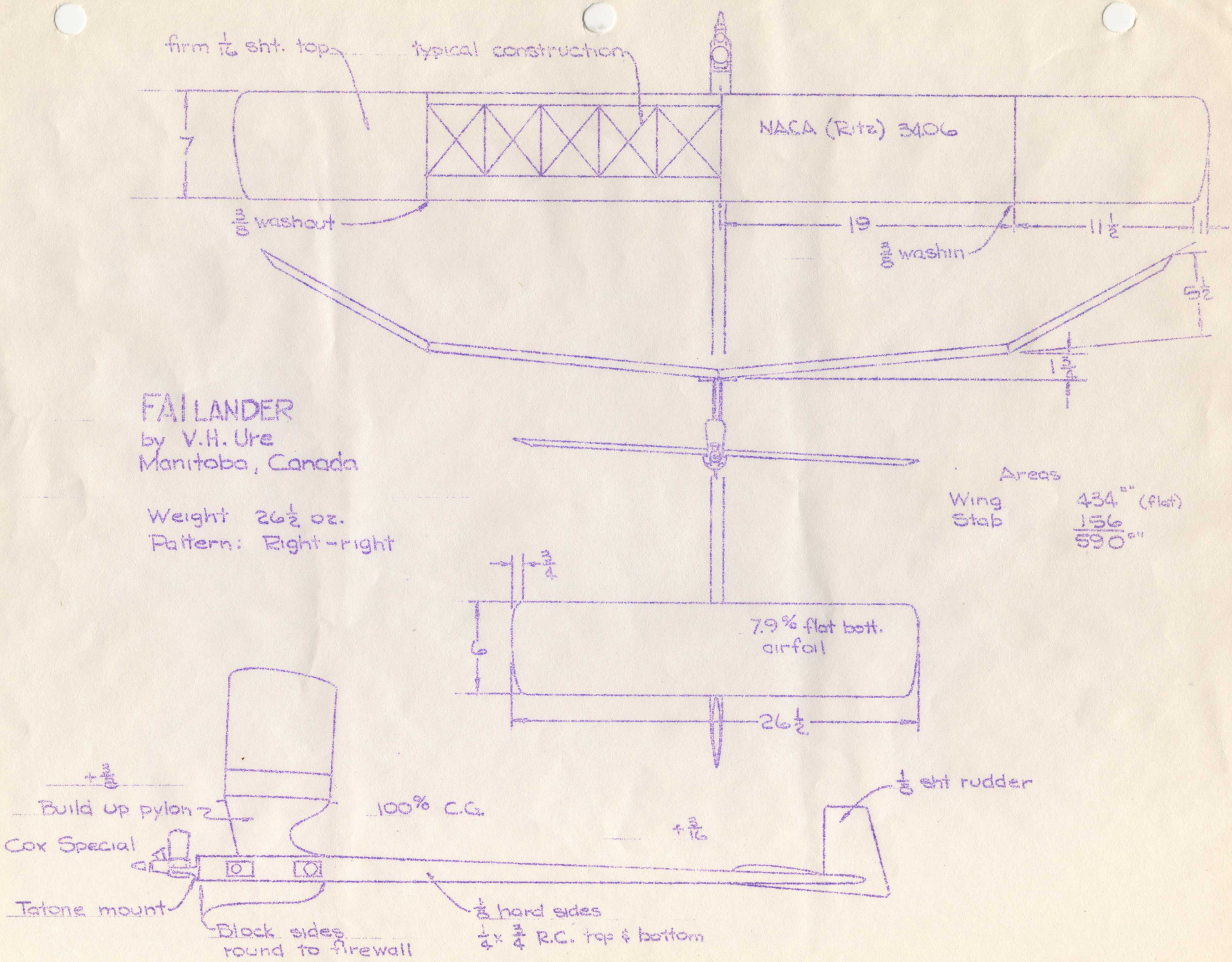
FLORIDIAN - BETTY AND BILL BELL, DELRAY BEACH, FLORIDA

(Bill's comments) "This thing keeps on winning against all the exotic looking jobs - even I built one and succeeded (in) beating Gerry Ritz at this year's King Orange and taking first place. Steve Parker of Fort Worth and a protege of ours when we lived there, won first* with the design in junior with a time higher than Hartill in open and thus took home the big Tulsa trophy. (Editor: Well Gerry, that takes care of us!) Suffice to say that it is a simple to build and yet very efficiently flying machine. It's pretty hard to beat in the U.S. and it very definitely was designed for this county.

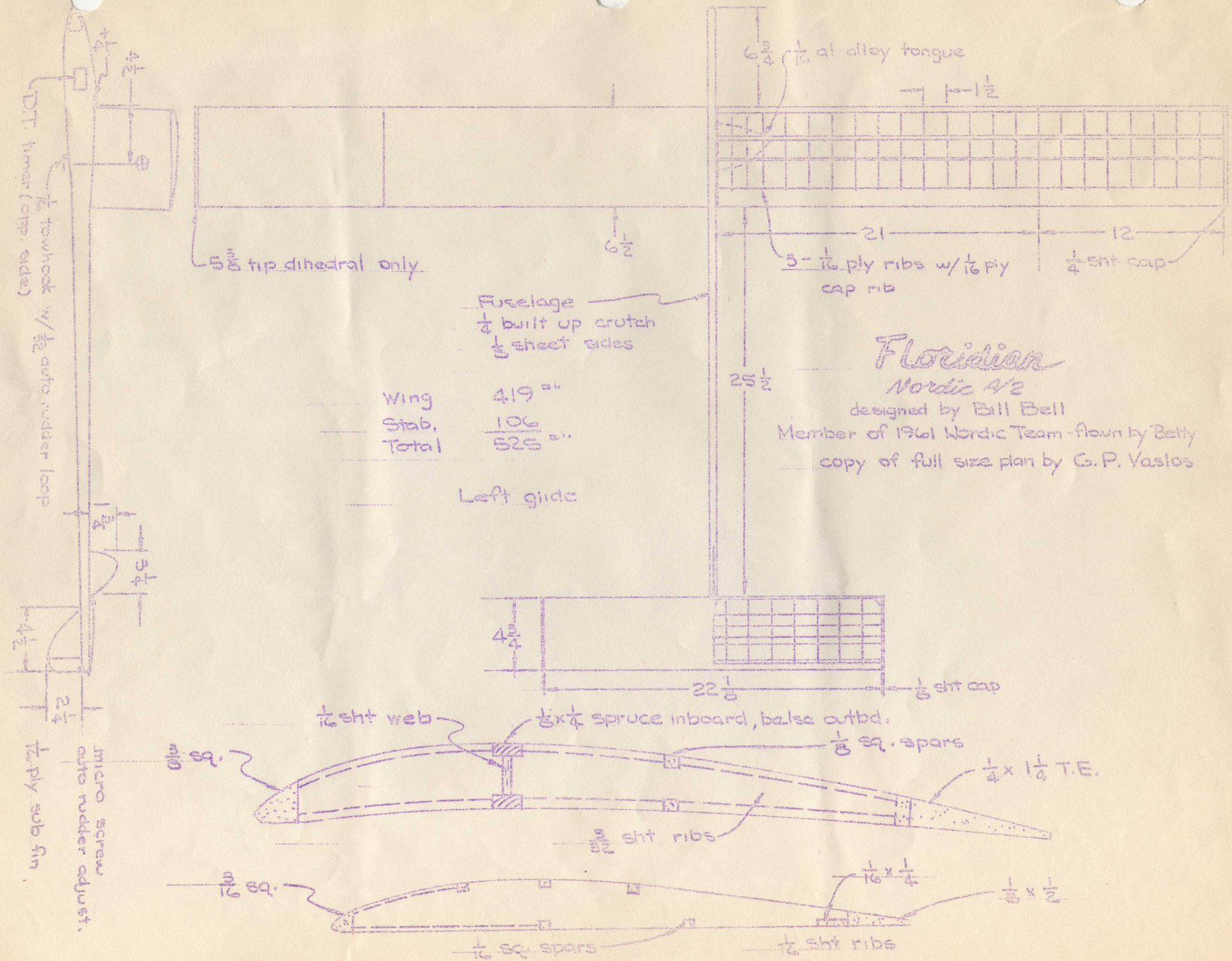
I'm working on a higher aspect cleaner version for Europe weather. We just didn't have time in 1961 after the semi's to come up with a completely different airplane - wish we could have so Betty could have placed better at the finals."

Thank you Betty and Bill, you're right, it sure looks simple to build. I think our readers would also like to know a bit more about the design features

*(62' NATIONALS)



Cusick May '63


6¾
1/16 al alley tongue
1½
6½
5⅜ tip dihedral only
21
12
3 - 1/16 ply ribs w/ 1/16 ply cap rib
¼ sht cap
Fuselage
¼ built up crutch
⅛ sheet sides
25½
Floridian
Nordic 4½
designed by Bill Bell
Member of 1961 Nordic Team - flown by Betty
copy of full size plan by G. P. Vasios
Wing 419 sq"
Stab. 106
Total 525 sq"
Left glide
4¾
22⅛
⅛ sht cap
1/16 sht web
⅛ x ¼ spruce inboard, balsa outbd.
⅛ sq. spars
¼ x 1¼ T.E.
⅜ sq.
⅜ sht ribs
3/16 sq.
1/16 x ¼
⅛ x ½
1/16 sq. spars
1/16 sht ribs
DT timer (top edge)
2¼ towhook w/ ¼ auto rudder loop
4¼
4½
1¾
3¼
1¼
2¼
¼ ply sub fin
micro screw auto rudder adjust.

and perhaps some of your thoughts on why it flies so efficiently. Could you oblige?

NEXT MONTH

"Soarcerer", I hope; a hot FAI; contest impressions; a study of "Specialization"; and a new recipe for fried chicken.

SCAT CONTEST 2

JUNE 30

SEPULVEDA BASIN, LOS ANGELES

A QUIET MEET!

ALL YOU WILL HEAR WILL BE TICK-OFF TIMERS AND RUBBER BUSTING

NORDIC A-2 & WAKEFIELD

FLOWN BY ROUNDS (FIRST ROUND 8 → 10)

This issue marks two years of publication. Happy Birthday, Staff! This also means renewal time since we try to make it easier on ourself by figuring subscriptions starting in April. Because of our limited reproduction capacity, we cannot guarantee your receiving back issues so please renew your subscription now.

If you started your new subscription and sent us $2.00 any time between now and last Oct. 1, ignore this notice, you are paid up for the coming year.

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