THE

SCATER

published by Southern California Aero Team (14)

May 1962

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DESIGN 54...WHERE ARE YOU????

Maybe it is due to the immediate advent of the summer round of U.S. FAI Team Qualification Trials; or maybe it's that too many of our U.S. readers are too bashful; or maybe it's that we have laid off badgering them for publishable material lately.

Whatever the reason there has been a real dearth of FAI designs coming in lately from our U. S. readers. Readers from overseas on the otherhand have been very cooperative in their material contributions.

Now, since this publication is supposed to be international in scope these contributions from other countries are most welcome...but we want to give the "home boys" a chance, too.

Too often, we fear, there are many good model designs, and article subjects which the designers/authors are somewhat hesitant to send to us because they think it may be presumptuous or because they think we have too much material on hand. We'd just like to assure you all that we'll be happy to receive any and all FAI-slanted contributions...and, though space is of course limited, we'll find room for them.

The other possibility, of course, is that many would-be-contributors have good material at hand, but just "haven't gotten around to sending it." They intend to do it "tomorrow"...but somehow the time slips by, and it doesn't get sent.

To this contingent of our readers we'd just like to say, why don't you stop reading this right now,...go get that stuff, pop it in an envelope, address and stamp it...then come on back and enjoy the rest of this issue. If you'll do this, you'll be helping make some future issue just that much more enjoyable for all other readers. O.K?

NEWS OF THE READERS

This month's list includes the following:-

SORJO RANTA, Ottawa, Canada
WALTER MOONEY, San Diego, Cal.
GORDON SMITH, San Diego, Cal.
JACK DANIELS, Oak Lawn, Ill.
AL ULM, Del Mar, Cal.
H. & J. ASHWORTH, Lancashire, England
NAT ANTONIOLI, San Diego, Cal.
AUTHUR GUNNETT, Encinitas, Cal.
GENE SCHAAP, Chicago, Ill.
BILL BOGART, Westerville, Ohio

ANDY CRISP of Oxford, England, writes to tell us that he wrapped the original "Buckeye" (January '62 SCATTER) around a tree in a 40 mph wind! Says he can readily recommend it for anyone looking for a stable, compact, rough-weather A/2 (We can believe it!). Promises to send along plans for a new Wake soon.

C. P. "Bud" PUCKETT, Mt. Vernon, Ill. is looking for the drawings of the Van Nest/Cusick A/2 published in the June '61 issue. Sorry, Bud, we have no more of this number. Are there any readers in Mr. P.'s area who can lend him a copy?

JACK DANIELS writes to say he's just moved to the Chicago area from Tennessee and got word of us through some friends in the Illinois Model Aero Club. Well thank you IMACs. Say, Jack, coming from the land o' mountain dew, and with a handle like that, you wouldn't...no, guess you wouldn't... ...but it was an idea. Wow! What a subscription fee that would be!

BILL BOGART, Westerville, Ohio, is a new reader who asks if we are interested in new designs and innovations. Sure 'nuff!, Bill. Just keep to FAI-FF specks or applications. He also passes along the encouraging news that a new club of competition-minded free flighters has been formed in his area. Also tells us one of the members has been quite successful with some competition canard layouts. We'd like to see something on this to FAI specks, Bill.

AL VAIL of Denver says he's a relative new comer to FAI-FFG but since discovering it a couple of years ago he's convinced that this is IT...because it gives a definite direction to his modeling. (Well put, Al.) He also enclosed some guide lines he uses in his Power designs, which are:

1. Hi thrustline with flood-off
2. Sheet wing a la Blanchard (at least 9:1)
3. Approx. 25% stab
4. Auto rudder
5. Tatone DT, with fuse back-up (a la Conover)

How does this stack up against <u>your</u> latest dream design, huh?

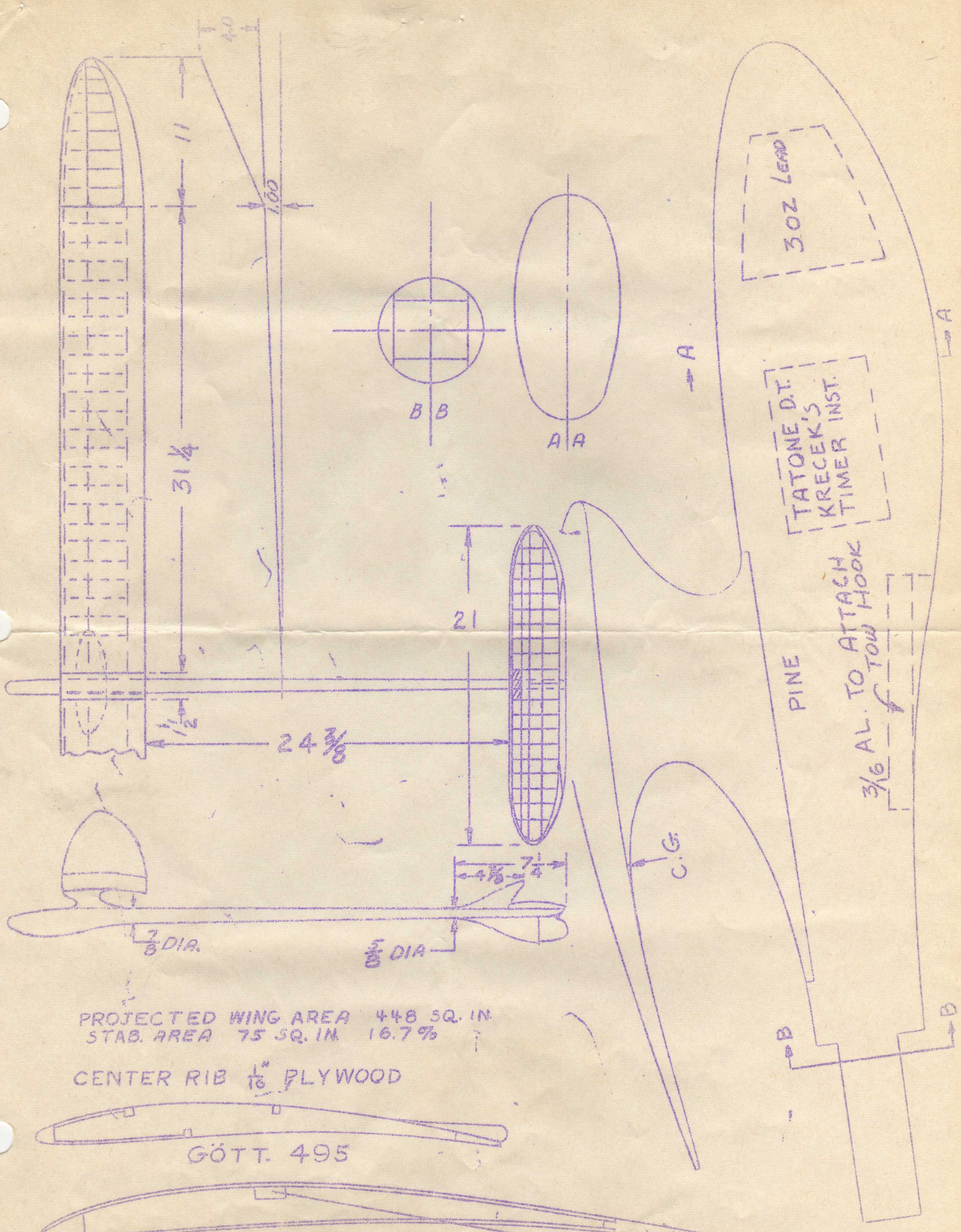
STAN CHILTON of Wichita lent us some photos of his new FAI power ship. Really out of the rut! Sheet topped wing and stab...forward fin...completely cowled, inverted engine...etc. Looks like a cl speed job with overgrown wings! Says he'll send along the plans this summer. Don't delay, Stan.

DAVE WILSON, Irving, Texas, stopped by recently during a business trip out here to LA. Dave's current pres. of the Cliff Cloud Climbers, the Ed's old club back in Dallas. He reports the good news that FAI-FF is on a real upswing in Big "T" these days. Many new ships are just awaiting a slight drop in the 40 mph plus winds to get trimmed. Dave also described an interesting "engine running" contest the Dallas-Ft. Worth guys put on each year. All engines use the same make of prop and fuel...readings are taken on a tack. This year's prop was an 8X4 Power, and fuel was "This Is It." Dave won with his Super Tigre which topped out at 20,500. How's that sound, you power bugs?

<u>A/2 NORDIC by Bob Wiehle (SCAT club)</u>

I was lucky enough to be a member of the 1959 American Nordic Team in Belgium and watched Ritz win the World's Championship. This convinced me of several things.

Ritz 's model had a beautiful glide and marvelous recovery when upset.



PROJECTED WING AREA 448 SQ. IN.
STAB. AREA 75 SQ. IN. 16.7%

CENTER RIB 1/16" PLYWOOD

GÖTT. 495

LINDNER PINE

SCALE 1/8" = 1"

RLW

Except for the winning fly-off flight the model handled very poorly on the tow. On the other hand Tahkapaa's model was terrific on tow but just average on the glide.

On returning home I decided to combine the two designs and the model in the drawing is the result. The model was a very fine performer (until lost recently as a result of a stuck timer) and went through several revisions from the original concept.. The model just missed getting me on the 1961 Nordic team by two seconds...but close only counts in horseshoes!

The original had 1/32 sheet top and bottom from the dihedral break inboard. However, the one I'm working on now uses 1/32 cap strips on the bottom and silked, and 1/32 sheet on the top.

If you notice the tow hook is set with the aft end closer to the center line than the forward end. This sometimes makes it tough to release in strong thermals, but has the advantage of keeping the model on the line in sudden downdrafts.

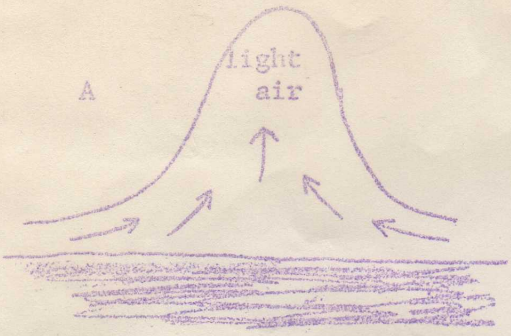
This model can be "bounced" off the line without worrying about a stall. The nose just pops around, one bounce, and you're off and thermaling.

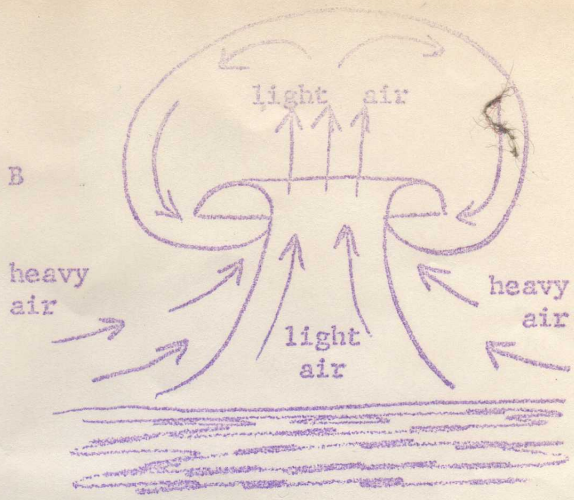
ON THE NATURE OF THERMALS AND THERMAL SOARING by Glenn C. Kinney (New England Wakefield group

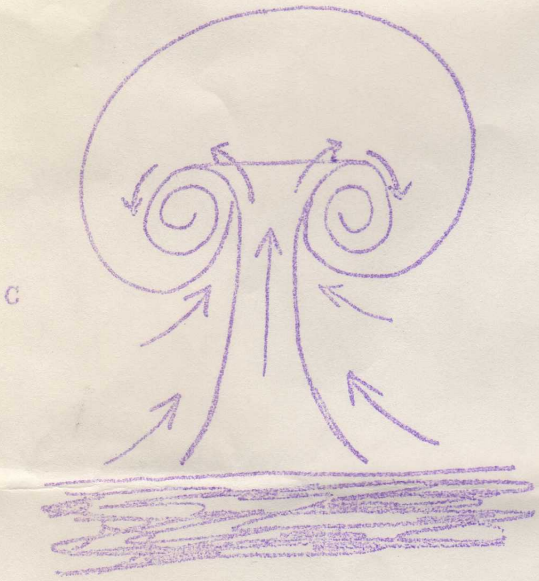
Several articles in SCATTER and elsewhere in model airplane literature have described the structure of thermal bubbles, the motion of the air in the bubble, and the conditions which produce thermals. Recently, Mr. Clarence D. Cone, Jr., has published articles in the American Scientist (March '62) and the Scientific American (April '62). His description of thermals is quite different from that found in the model magazines and news sheets. What Cone reports may enable us to make our thermal flying more effective by helping us to do two things; first, to discard certain cumbersome and probably false beliefs, and second, to focus attention on those model design features and flying practices which increase soaring ability. In this article I will report on Cone's material, and add some comments of my own.

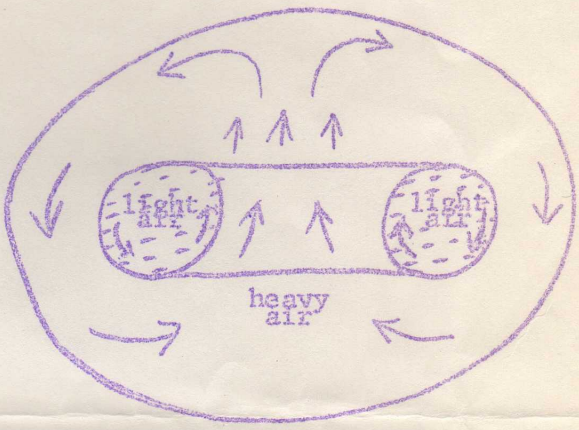
In reading what follows it may be helpful to recall some facts about the air in which we fly. The air in a thermal generated by heat is hotter and lighter than the surrounding air, but both are at the same pressure. In other words, a thermal is not a low pressure area. Also, humid air at a given temperature and pressure is lighter than dry air at the same temperature and pressure. Damp air is not heavy air, but just the opposite. Therefore, if water evaporates into a body of air at constant temperature, that body of air will be lighter than the surrounding air, and at the same pressure. All that is necessary to make a bubble of air rise, as it does in a thermal, is for that body to be lighter (less dense), but not necessarily hotter, than the surrounding air.

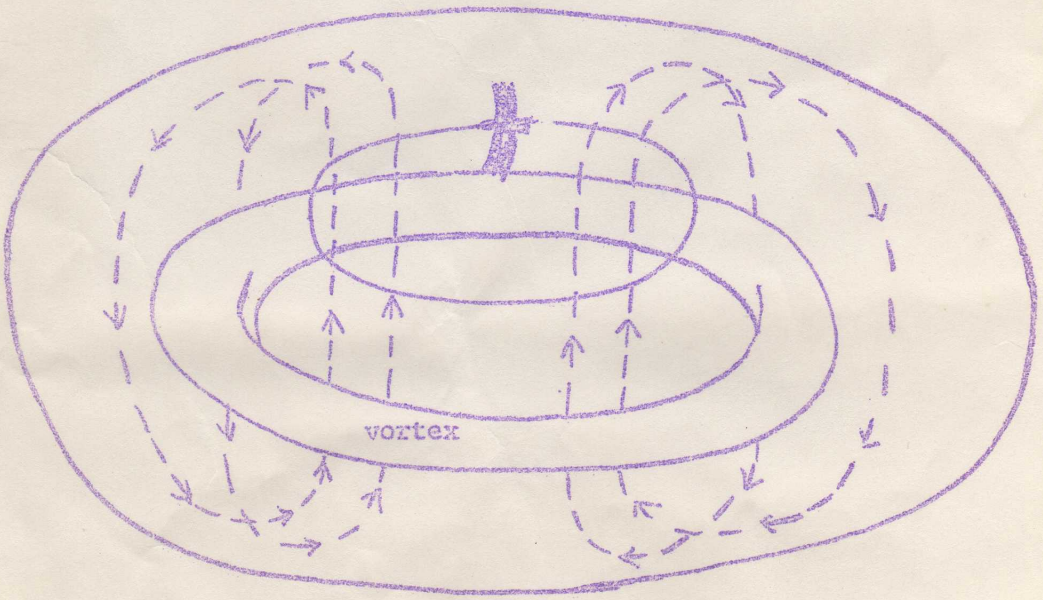
According to Cone, a thermal develops as shown in the drawing. Hot air or moist air (or both) form on the surface due to the action of the sun, and a layer of lighter air is built up. Eventually a protuberance occurs (A) and the thermal air starts to break away from the surface. As the lighter air rises, heavier air flows in from all directions (B). The resulting air flow forces the rising light air into a doughnut shape in which the air flows circularly upward on the inside and downward on the outside, as in a smoke ring (C). The ring and its closely surrounding air is finally pinched off at the base, and it rises in a bubble or shell (D). The shell continues to











Sketch of thermal formation and final structure

rise while the denser air gradually mixes with the lighter air. Eventually the shell dissipates. The currents in the thermal shell are shown at (E) along with the flight path of a bird (or model) circling in the shell and rising with it.

Cone presents evidence and observations which support this description of thermals. He shows why a thermal is not a column of rising air, and why it is not just a rising bubble of air without the special inner flow patterns just described. He also shows that the best soaring conditions occur in calm weather and that the higher thermals are the stronger ones (faster vertical air flow upwards in the hole of the doughnut). He discusses the aerodynamics of thermal soaring. Stable soaring is achieved only above the plane of the doughnut (where the flight circle is shown in the drawing). The tighter the circle and the slower the rate of descent of the soarer, the weaker the thermal needed for soaring. Soaring ability, therefore, is directly related to low wing loading, high lift coefficients, and low drag.

I noted with interest that Cone made no mention of a "thermal pulse". The notion that thermals occur at regular time intervals seems to be held mostly by a few modelers and they are firm and staunch believers. It has been claimed that thermals have been timed on the basis of surface cues, such as wind currents or sudden calms, in spite of the obvious difficulty of knowing that a thermal has departed the surface or of identifying the surface cues with a given thermal. The difficulties and limits of observation are not discussed. Suppose for example, that thermals in a given area were being produced frequently but at odd and irregular time intervals, or as Cone puts it, in the manner of vapor bubbles forming on the bottom of a pan of water being brought to a boil. In such a situation, it is not difficult to understand how someone with a stopwatch who is looking for gusts or calms as signals of thermal formation would manage to see something to make him believe that a thermal had indeed formed and departed at the moment he knew it was due. He is even more easily convinced if he is willing to tolerate variations from exact time intervals. All the other thermals, and all the other similar cues, would be disregarded or unnoticed. The observer would conclude that thermals occurred at regular time intervals, just as he had believed before he started timing. However, variations in local gust conditions, local temperatures, and local ground and air humidities make it unlikely that thermals would occur at a regular rate, or that any such rate would long remain constant if conditions did so chance to hold steady for a short time. Cone states that thermal finding by airborne birds seems to be largely a matter of luck, but that some birds appear to detect the departure of thermals near them under calm conditions. Until better observations are made over large areas on numerous occassions, the "thermal pulse" seems to be more speculative than factual.

It was also noted that Cone made no mention of the "Coriolus Spiral" which holds that a thermal twists as it rises, as if it were a special case of dust devil, whirlwind, tornado, or cyclone. To my knowledge, there is no direct evidence that a thermal shell rotates in the horizontal plane as it rises. If such motion were imparted to the shell due to shear forces at the time of the shell's origination, the motion would soon be damped out by viscous resistance and mixing at the shell's outer boundary. Just which forces are generated as a result of the shell's motion which would cause or support horizontal rotation is never made clear, and the Coriolus force is usually misrepresented in most discussions which mention it (remembering that a thermal is not a low pressure area will account for most of the flow diagrams often included in such discussions). Of course, cumulus cloud formations which result when thermal bubbles reach conditions which condense

the water vapor they carry show no signs of horizontal rotation whatsoever. The "Coriolus Spiral" appears to be an unsound idea open to a careful re-appraisal.

From Cone's articles we can draw some reasonable inferences about FAI model building and flying. The higher the model after its power run, the more likely it is to find a strong thermal, which is not news to us. For gas powered models and Wakefields in the glide, and for Nordics, soaring ability increases as the airplane's gliding rate of descent decreases. Since the model must circle to stay in the thermal shell, a premium is placed on a high lift coefficient and low drag for the model as a whole. It follows that the best soaring ability is not attained with non-streamlined models with low aspect ratio wings. For Nordics and Wakefields, to be brief it appears that good soaring ability would be attained with aspect ratios from 12:1 to 16:1 with wing planform tapering at least in the outer panels, and with tapered thickness and washout up to about 4 degrees in the outer panels. Careful streamlining, a good finish, and turbulation on the main wing are probably advantageous, the turbulation especially so. Gas powered models probably need lower aspect ratios for strength, but the remaining design feature still apply.

In the glide all models should circle (either way). Cone reports that one particular bird (its wing loading is approximately .50 pounds per square foot compared to .30 for a Nordic), which soars in very light thermals, ordinarily flies in a circle of radius 40 feet, but has been observed circling with a radius of 70 feet. The airplane should be properly banked in order to minimize drag due to yaw, slip, or skid. For many designs circles of 40 to 70 feet in radius will be small enough to produce a high rate of descent. Such models will not soar well in light lift.

In summary there seems to be some reason for building efficient models (high lift, low drag for the complete airplane) for thermal soaring. One can always build what suits the taste and depend on thermals when needed. The wiser course seems to be to try hard to build and trim efficient, stable models and to seek thermal help as a bonus. Building well throughtout, aerodynamically clean airplanes for thermal flying is not so mad an idea as some would have us believe.

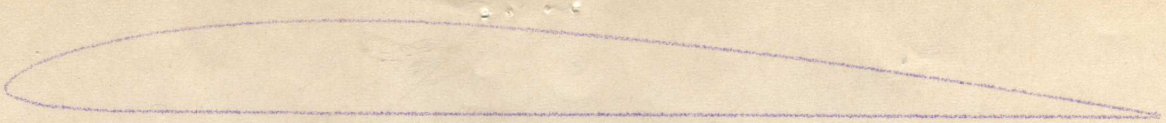
STABILIZER AIRFOIL SUGGESTIONS by Craig Cusick & Ken Sykora

We've tried to select a number of representative stab airfoils to be used in the three FAI-FF classes. Two each are shown for FAI, Power, Wakefield, and Nordic A/2 Glider, respectively. This group is not intended to represent any special or magic solutions for your designing problems. But since very few suggestions on this important aspect of design have ever been presented to us we thought we'd start the ball rolling!

POWER

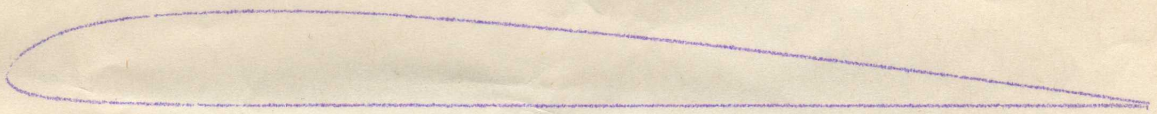
RHODE ST. GENESE 28--This airfoil has probably been suggested for use most often as a non-zip/zip hand launch glider airfoil. The flat bottom and relative thin-ness should fit right in with the trend toward thin stabilizer airfoil for FAI power models.

CHEESMAN 20A-08--This airfoil was designed by Gail Cheesman as a stabilizer section for model sizes. It is said to have good lift characteristics and low drag and a high stalling angle.



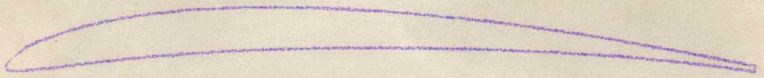
Rhode St. Genese 28

Station	0	1.25	2.5	5	7.5	10	15	20	30	40	50	60	70	80	90	95	100
Upper	1.87	3.35	3.97	4.84	5.6	6.12	6.85	7.46	7.58	7.23	6.65	5.71	4.55	3.15	1.58	.82	0
Lower	1.87	.78	.46	.24	.12	0	0	0	0	0	0	0	0	0	0	0	0



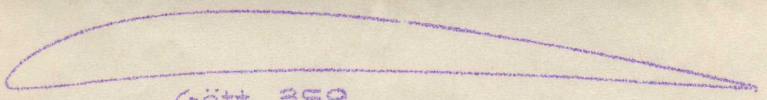
Cheesman 20A-08

Station	0	1.25	2.5	5	7.5	10	15	20	30	40	50	60	70	80	90	95	100
Upper			5.8	6.6	—	7.5	—	8.0	7.9	7.1	6.3	5.2	4.0	2.8	1.4	—	0
Lower			.68	.3	—	.06	—	0	0	0	0	0	0	0	0	—	0



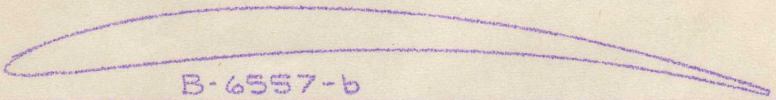
B-6405-b

Station	0	1.25	2.5	5	7.5	10	15	20	30	40	50	60	70	80	90	95	100
Upper	.8	2.4	3.3	4.5	5.5	6.2	7.2	7.8	8.5	8.6	8.1	7.2	6.0	4.5	2.7	1.7	.5
Lower	.8	0	.2	.5	.9	1.2	1.8	2.2	2.8	3.2	3.3	3.1	2.8	2.1	1.3	.8	0



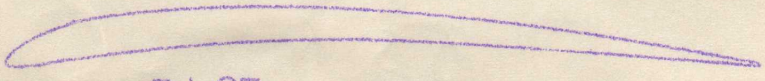
Gött. 359

Station	0	1.25	2.5	5	7.5	10	15	20	30	40	50	60	70	80	90	95	100
Upper	.8	2.5	3.6	5.3	6.6	7.5	8.8	9.6	10.3	10.0	9.2	7.9	6.3	4.4	2.5	—	.2
Lower	.8	0	0	.2	.5	.8	1.3	1.8	2.5	2.7	2.6	2.4	1.9	1.3	.6	—	.2



B-6557-b

Station	0	1.25	2.5	5	7.5	10	15	20	30	40	50	60	70	80	90	95	100
Upper	1	2.6	3.5	4.6	5.5	6.4	7.5	8.4	9.65	10	9.9	9.2	8.0	6.0	3.6	2.0	.5
Lower	1	.2	0	.4	.75	1.1	1.7	2.4	3.6	4.5	5.1	5.2	4.8	3.9	2.2	1.1	0



EJ 95

Station	0	1.25	2.5	5	7.5	10	15	20	30	40	50	60	70	80	90	95	100
Upper	.5	2.3	3.7	4.7	5.8	6.5	7.3	7.7	8.0	8.0	7.5	6.7	5.5	4.0	2.3	1.5	.5
Lower	.5	.2	.4	.8	1.3	1.5	2.2	2.8	3.7	4.0	3.8	3.3	2.7	2.0	1.1	.5	0

WAKEFIELD

GOTT 359--Should be a pretty fair all around Wakefield stab section. Undercamber highpoint is not back too far and it has thickness in keeping with normal rubber model practice. Should provide non-critical longitudinal stability in most weather.

BENEDEK B 6405 b--This section is normally associated with ultimate performance as a wing section for Wakefields. Why should it not be used as a stab airfoil for one looking for slightly better sinking speed in the glide?

A/2 GLIDER

BENEDEK 6557 b--Developed as a high calm air time Nordic A/2 airfoil. Might be employed as stab airfoil also for high calm air time associated with "diving trim", rearward C.G.'s and small stabilizer areas.

E.J. 95--Rather highly undercambered but camber high point is relatively far forward at 40%. Should give tolerant performance in most kinds of weather. Difficulty may come in building to small chord sizes. All sheet stab, maybe?

FROM THE NOTEPAD

*****Word has come through that N.Y. reader Sal Cannizzo has taken over the New England Wakefield Supply outfit. Specialities of this firm include Pirelli rubber, glider winches, wing tongues, front end (rubber) assemblies, rubber model winders, thrust washers, music wire, springs, bushings, etc., etc. Lots of luck in this new venture, Sal! The address is: New England Wakefield Supply, P. O. Box 4, Staten Island 5, New York.

COMING NEXT MONTH

For the June issue we've come up with a real cross section of model drawings for you. There'll be a Wake. from Poland, a Nordic from Norway, and a Power ship from Hungary...plus, of course, the usual brand of wildness we can never foresee!