THE

SCATER

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IT'S WHAT'S UP FRONT....THAT COUNTS!!

It's funny how some manufacturers in the model industry miss the boat. FAI-wise, a good case in point is the matter of power props vs. power plants. Most makers of .15 size engines have made truly remarkable strides in recent years toward output potential.

Yes, we said potential because right now that's all it is. The reason is that FAI-FFers are still saddled with hopelessly outdated propellers which won't allow that engine power potential to be full transmitted to it's full and useful "pull."

The CL speed boys learned this lesson years ago. They soon discovered that no matter how well tuned their Belch-Fire Six was or how hot a fuel they concocted, it was just No-Go without the right prop up front. Today these guys can choose from a wide variety of props designed to do a very special job and do it well.

FAI-FF has become just as critical; but there are no "special" FF props we can buy. (Carving or "rewording" commercial props is one answer...but a losing one the way those heavy FAI's DT!) We are in the 20,000 rpm range, and 25 to 30,000 is just around the corner as an "operating standard." But today's commercial FF props were never designed for this kind of turning. From design, structure, and efficiency standpoints they are hopelessly obsolete.

So there it is...a brand new market just waiting for some smart prop maker. But he must re-adjust his thinking...his entire design concept. He must forget about "stock" designs based on "ancient" blade patterns and pitch/diameter ratios. He must deal with the realistic figures of 20,000 rpm and upwards! And he must also remember that small, simple, efficient, and brutally powerful "Wankel-type" rotary model engines are now firmly on the horizon... and that they will make bookends of today's most powerful conventional .15's.

His fresh thinking must center around two critical factors: rpm and efficiency; or in plain English, "turns X pull." His laboratory will need a stable power source, capable of carefully controlled rpm...again in the 20,000 and beyond range. And in conjunction with this he will need a device to carefully check each prop design's "pull" factor at specific rpms. (There are fancier engineering terms and charts for all this...but let's be practical... what we're interested in is how hard it will "yank" that FAI model up!)

Once he's tried his combinations of diameter, pitch, blade design, airfoil, hub design, etc., and found the best combination for a specific rpm and bhp range, then he's ready for production.

These new props wouldn't be classified by the oldpitch/diameter method.. (remember?...that's dated thinking!) Instead, you'd rush into your local toy store and yell, "Give me a 20 X 40 prop please!" (Translated, this of course, means you want a prop for an engine which turns 20,000 rpm to develop .40 bhp. (It might be a 14 inch diameter by 13.6 mm pitch with a blade 3/16 inch wide; but you couldn't care less). You'd slap this on your brand new Gold Medal Knuckle Buster (which has this power rating) and if it didn't produce then you'd know something was wrong with the engine...because the prop would be right!

Yes, it will be a wonderful day for the FAI-FFer when one of the commercial prop whittlers decides to throw away yesterday's designs and tries to catch up with the wonderful potential the engine makers offer. Only then will we begin to uncover the fantastic power these .15's still have locked inside them!

"OIZORAR" WAKEFIELD by Marc Cheurlot (from "Model Avia")

(Ed. note: This ship was picked up from the Belgium magazine, Model Avia, which is sent to us by SCATTER reader P. Delfeld, of that publication. We are reproducing it because it seemed like a very interesting "out-of-the-rut" approach to the wake. formula, and we thought other readers would like to study the many unusual features of the overall approach. Sorry our translation of the article that accompanied the drawing wasn't good enough to print. However, one point we did glean from it was that Cheurlot was trying to sweep as much of the wing as possible with the prop blast. His idea came from study of the Breguet 940 cargo carrier.

FROM THE NOTEPAD

*****SCAT pres., Jim Trego has been up to all sorts of tricks out at the local flying field lately. He's rigged up some tripods, cameras, etc. The point of all this activity is some practical measurement figures for the heights gained by current FAI Power models in the ten second engine run. Soon as Jim has some findings for us we'll let you know.

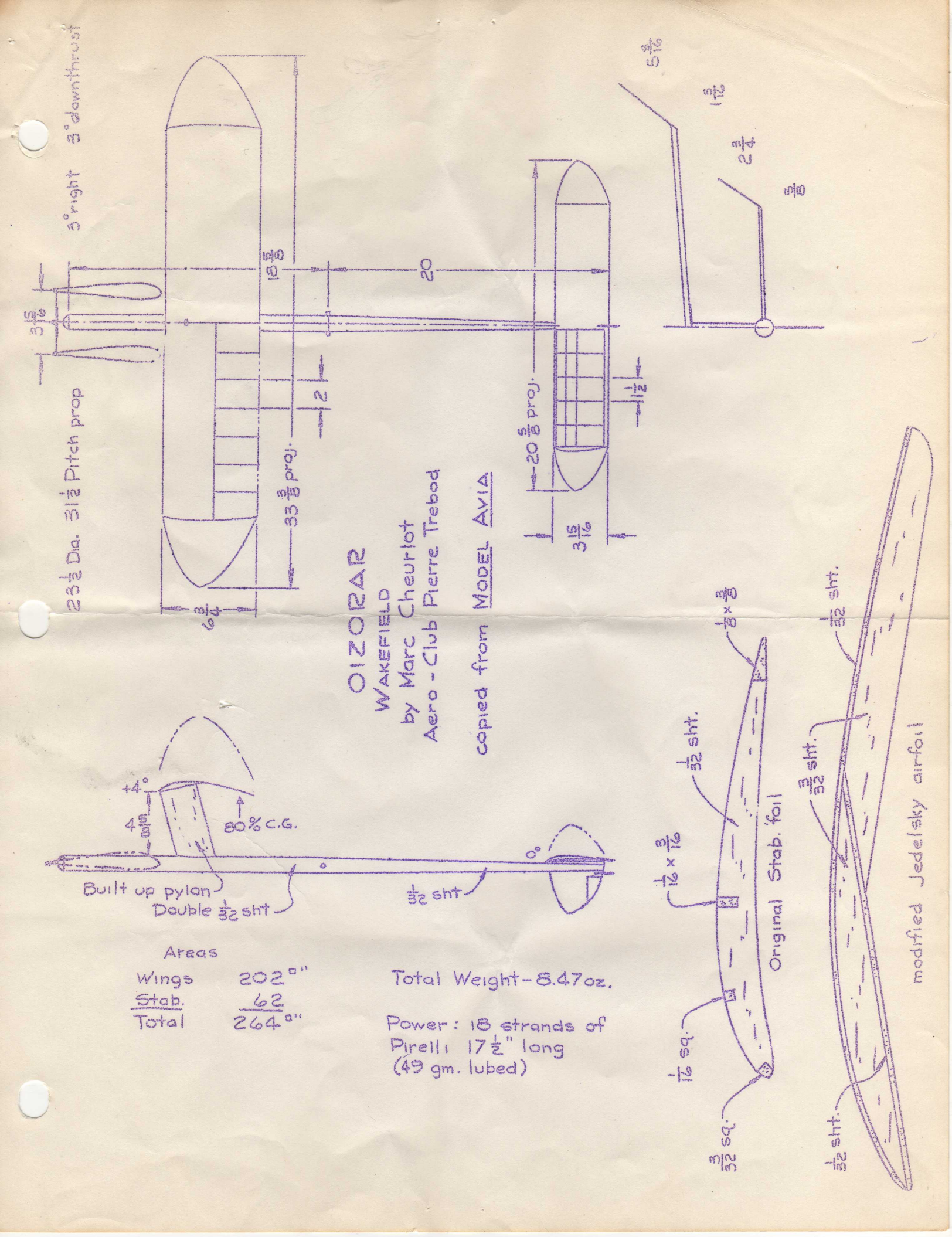
*****The editor has done some bench running of one of the new Cox 15's. So far best performance was 19,500; with some rather hot fuel, and an 8X4 Power prop. Seems this engine is a real "plug-eater". To try to cure this Bob Van Nest has tapped some Cox heads to take standard type glo plugs. Seems like a cure but we'll wait awhile before saying for sure.

NEWS FROM THE READERS

This month's paid list is made up of the following:

DAVE GOODWIN, Leeds, England
BUD PUCKETT, Mt. Vernon, Ill.
JOHN LENDERMAN, Sunnyvale, Cal.
JOSEPH PUSATERI, Bethpage, L.I. N.Y.
LT. MELVIN ALLEN, Phoenix, Ariz.
ED ORNDORFF, Burbank, Ca.
ARTHUR WATKINS, Mountain View, Cal.
HARRY STEINMETZ, San Diego, Cal.
JIM JUHL, Rochester, Minn.
DAVE WILSON, Irving, Tex.
WILLIAM BURGESS, Muncie, Ind.
ANDREW CRISP, Oxford, England
R. KNIGHT, Lancs. England
JIM MANN, Los Angeles, Cal.

HUGH LANGEVIN, of Mpls, Minn. sends along an interesting plan for FAI club teams, which has been developed by the Mpls. Model Aero Club. Briefly, the plan calls for a "qualification" of club members interested in FAI FF classes. Once the club member qualifies (5 flight total of 12 min. in FAI gas, and 13 min. each in Wake and A/2) he is entitled to a "rating" of one to



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WAKEFIELD

by Marc Cheuriot

Aero-Club Pierre Trebod

copied from MODEL AVIA

Areas

Wings	202 sq"
Stab.	62
Total	264 sq"

Total Weight - 8.47 oz.

Power: 18 strands of Pirelli 17½" long (49 gm. lubed)

three stars (which are placed on his model, jacket, cap, etc.) (Ed. note: Something like the "C" ratings for soaring pilots.) The number of stars indicates how far above the basic qualifying requirement the flyer has gone. As for the end result hoped for in this plan, we'll quote directly from the explanation sheet supplied by Hugh:

"One of the purposes in getting this group together is to make possible the compilation of as much accurate data as possible on construction, performance and flying techniques of FAI models. In particular, we will try to work TOGETHER to gather or work out new information, new building and flying techniques, etc."

Hugh says he hopes other clubs will be stimulated by this basic plan to form their own FAI "club teams" so that various clubs will be able to field teams for team contests either at the same site or via the mails. He wraps up the plan with this sound idea...

"If present modeling trends are any criterion, the FREE FLIGHT enthusiast will find more and more attention centered around FAI modeling. The formation of teams as described would generate much more interest, companionship, competitive spirit and above all a "drive" towards the improvement of skills and techniques!!".

Any of you club hotshots who would like the full story on this idea can write to Hugh at 14 East 51st Street, Minneapolis 19, Minn.

SOME COMMENTS ON EXHAUST TUNING by Bill Hartill

Ken passed along a letter from B. F. Joyner (Joyner Engineering) asking us to comment. As a result we are throwing them in here as they may be of interest to other SCATTER readers.

First of all my comments in a past issue of SCATTER on ram induction for FAI power were not about my own experiments but were a description of Werner Petri's extended inlet pipe on his FAI. Werner got the idea from his experience with motorcycle racing in Germany. Unfortunately, Werner only tried one length and didn't continue the experiment.

Secondly Joyner says: "Performance cannot be increased by changing the length of the tube between the entry point of air and the induction of fuel. Performance can be increased only by changing of the distance that the fuel-air mixture travels before entering the engine."

The concept of tuned inlet and exhaust pipes to increase the scavenging efficiency, and thus power, of internal combustion engines is rather old but little known. It is generally referred to as the "Kadenacy effect" because of a series of U.S. Patents issued to Kadenacy around 1937.

A Junkers opposed-piston Diesel was converted to the Kadenacy system in 1939 by Fetter in England. An increase in H.P. from 11 to 25 was obtained! This was without any alteration to the combustion chamber or fuel injection equipment and was done by only changing the inlet and exhaust ducts.

The Kadenacy patent claims that upon opening the exhaust port the gas leaving the cylinder leaves a depression below atmospheric pressure. This depression helps move the incoming charge into the cylinder if the timing of the intake and exhaust porting is currect. This depression augments that caused by the down stroke of the piston.

A more fundamental and earlier application of this principle is to be

found in the origins of the pulse jet engine. The first pulse jet was built in Germany in 1908 by Karavodine. His engine consisted of a long straight tube, the front end of which was fitted with an air flow check valve and the rear end open. The check valve allowed air to blow in, but closed automatically when the pressure inside the tube increased beyond atmospheric. A benzene nozzle and spark plug inside started the whole thing off. The sudden increase in pressure, caused by the explosion, closed the air flow check valve. Thus the gasses propelled themselves out the tail pipe at great speed and were directed so as to impinge on the blades of a turbine. As the remains of the gases from the explosion roared out the tail pipe a slight depression in pressure behind the air flow check valve was created. This is caused by the inertia of the escaping gases. The depression pulls in the next slug of air. All pulse jets operate on this principle.

A unique refinement was introduced by Lt. W. Schubert of the U.S. Navy in 1944. (A few months before the first V-1 was found.) Schubert replaced the vulnerable check valve (flapper) with a tuned inlet pipe. The inlet pipe was tuned to the cyclic frequency of the engine. The pressure waves in the inlet pipe were so timed that flow in was assisted during the induction part of the cycle and flow out of the inlet pipe (reverse flow) was resisted during the power pulse. This sounds like perpetual motion but it actually works. Ever been near a combustion heater when it is "chuffing"? Same thing.

Getting back to model airplane engines; tuned inlet and exhaust pipes could be used to "supercharge" an engine. Just how much could be gained is not known but enough information is available for someone to make a stab at it. The exhaust pipe can be considered an open ended organ pipe. A pressure pulse traveling out the exhaust from the cylinder is reflected back to the cylinder from the open end as a rarefaction wave. When it reaches the cylinder the rarefaction wave drops the pressure, helping to scavenge. The wave is then reflected back out again as a compression wave. The inlet duct works just the opposite. Optimum pipe length has been found to be:

$$L = \frac{S}{4\,RPS}$$

where: L = pipe length in feet

S = speed of sound in gas, ft. per sec.

RPS = engine speed, revolutions per sec.

"S" can be approximated as 1120 ft. per sec. for the intake and 1650 ft. per sec. for the exhaust.

RPM	Intake inches	Exhaust inches
15,000	13.4	19.8
17,500	11.5	17.0
20,000	10.1	14.9

These lengths are probably too long to be practical for a model. It might pay to try fractions of these lengths, such as 1/2 or 1/4. The simplest technique would be to try a telescoping pipe and adjust it while the engine is running. For further study I recommend the following reports:

*** Cornell Aeronautical Laboratory
Report No. DM-549-A-1
"Studies of Wave Propogation for Application to Engine Design"
J. G. Logan April 1948

*** NACA TN 1702
"Analytical and Experimental Performance of an Explosion-Cycle Combustion Chamber for a Jet Propulsion Engine"
M. A. Zipkin and G. W. Lewis Sept. 1948

*** Transactions of the ASME Vol. 68 No. 7
"Taking the Mystery Out of the Kadenacy System of Scavenging Diesel Engines"
P. H. Schweitzer Oct. 1946

1961 NORDIC GLIDER by Hank Cole (Palo Alto, Calif.)

(Ed. note: to the small handful of "uninformed" among our readers who may not know of Hank Cole's work in this hobby of ours, we will give this brief introduction. There are many modelers who are content to find competition success with "cut-and dried", proven designs (their own or others). And, there are modelers who get their kicks from constant experimentation... they are not concerned with contest success (and seldom have it!) but rather pursue the great unknown for the pure pleasure of the experimental "hunt". Hank is that rare modeler who combines both these qualities to a very high degree. His ideas and his models are always "reaching" in the region of fresh experimentation...yet he has always retained the "flyer's point of view". The happy result of this "cross purpose" approach (for those of us who have watched Hank's work for the past several years) is a string of "advanced" models which have won their share of awards in local and national contests. The A/2 glider Hank presents here is an excellent case in point.)

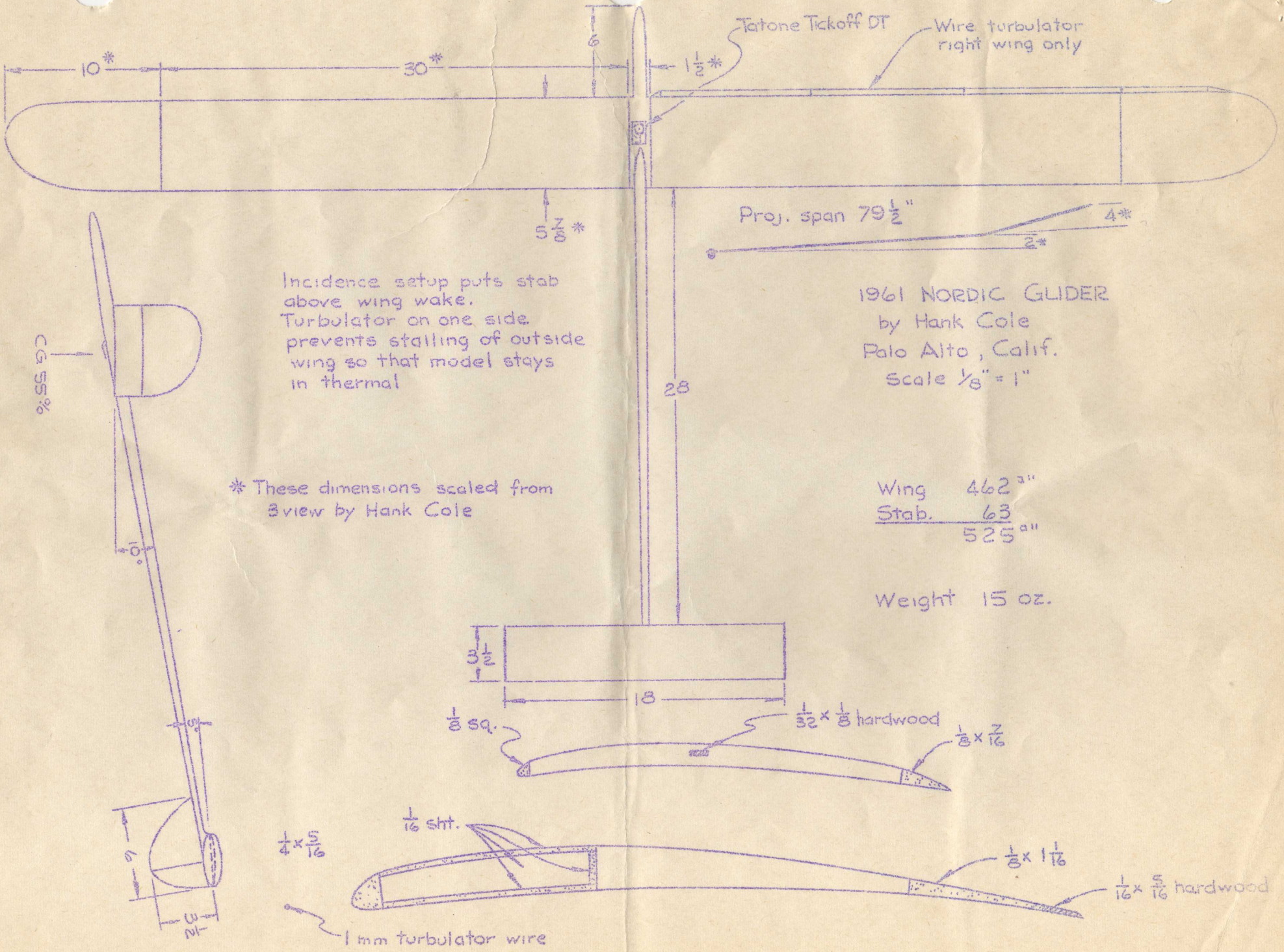
This is my new Nordic with which I broke the national record at our last record trials. I don't know if the record is official yet, but the time is higher than the last one listed. Times were: Five 3's, plus 3:30, 4:00, 4:30, and 0:49, for a total of 27:49. The stab got damaged on the eighth flight and the model dove in on the ninth flight. Didn't take time to trim the model with the broken stab because we were all ready to go home by that time.

The turbulator on one side only is the result of a little experiment one Sunday. Carl Hermes was asking me about the effectiveness of the wire turbulators so we decided to try the model with and without turbulators on each side. During these tests I would take the model up to about 50 feet and put it into a full stall and watch the recovery. You could notice a definite difference in the way the model stalled with and without the turbulators. During the test with the turbulator on the right side only, the model pulled out at about 25 feet and started to circle very tightly in a low thermal. As I followed it down the field and watched it clear a barbed wire fence, I noticed that each time the model was stalled by this violent low thermal the left wing would drop and the model would make a tight turn. It barely cleared the barbed wire fence and continued down the field at about 10 feet of altitude and finally dethermalized.

You will notice that I am still using the 10 degree set-up for my wing/stab. The airfoil on this new Nordic is primarily a result of my visit with Max Hacklinger in Germany last year. It is a compromise between the Wortmann airfoil and one of my sections.

ON LAUNCHING TOWLINE GLIDERS by John Wordin (SCAT club)

Here are some thoughts on launching a towline glider by the assistant. Plenty has been written on the tower about the art of towing and detecting thermals, but if the assistant doesn't get the model airborn, then an attempt,


10*
30*
1/6
1 1/2*
Tatone Tickoff DT
Wire turbulator
right wing only
5 7/8*
Proj. span 79 1/2"
4*
2*
Incidence setup puts stab
above wing wake.
Turbulator on one side
prevents stalling of outside
wing so that model stays
in thermal
1961 NORDIC GLIDER
by Hank Cole
Palo Alto, Calif.
Scale 1/8" = 1"
28
CG 55%
0°
* These dimensions scaled from
3 view by Hank Cole
Wing 462 3/4"
Stab. 63
525 3/4"
Weight 15 oz.
3 1/2
18
1/8 sq.
1/32 x 1/8 hardwood
1/8 x 7/16
1/16 sht.
1/4 x 5/16
1/8 x 1 1/16
1/16 x 5/16 hardwood
1 mm turbulator wire
CUSICK APR 62

or an official flight, can be lost.

How not to launch the glider is to stand still and let it slide out of your hand, dropping to the ground without any airspeed. Another procedure to avoid is to start to run with the glider, throwing it like a javelin straight ahead. If this is done you'll watch the glider go into a stall and nose dive. A third approach is to run with the glider holding it level and letting it slip from your hand, having the stab hit your head, and watching the tower running like a hare struggling desperately to make the glider climb.

All the above are common faults seen every Sunday at the flying field. From the above examples the reasons for a poor launch are too little airspeed and too little angle of attack. The following is a procedure which has worked 100% of the time for me after I taught it to my wife. First the how, and then the why:

The assistant should watch the tower at all times to receive signals and instructions. Hold the glider with the nose up at an angle of 25° or 30° about shoulder height and a little away from the body. Start to run at the same speed as the tower. When the towline is taunt and you are running pretty fast, give the glider a violent heave straight UP. It will be away without any trouble.

Vectorially, here is what is happening. (See figure 1.)

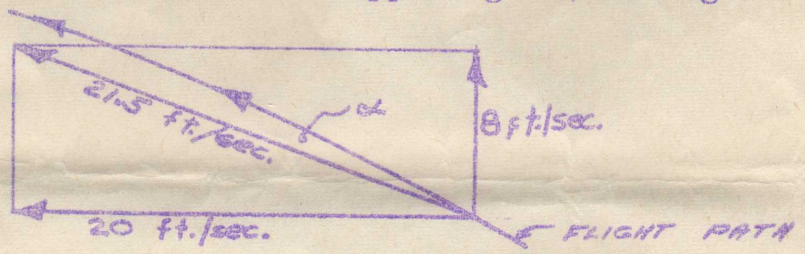


Fig. 1.

The forward speed, due to the relative wind and your running, can be taken to be about 20 ft/sec., and if you raise your arm (about 2 ft. in length) in 1/4 sec., then, the rate at which you raise it is 8 ft/sec. Adding the two vector velocities, the result is about 21.5 ft/sec (more than enough airspeed) and acting at an angle of about 22°. The angle of the fuselage will be about 25° or 30°, as can be seen from the diagram, and depends on the individual design.

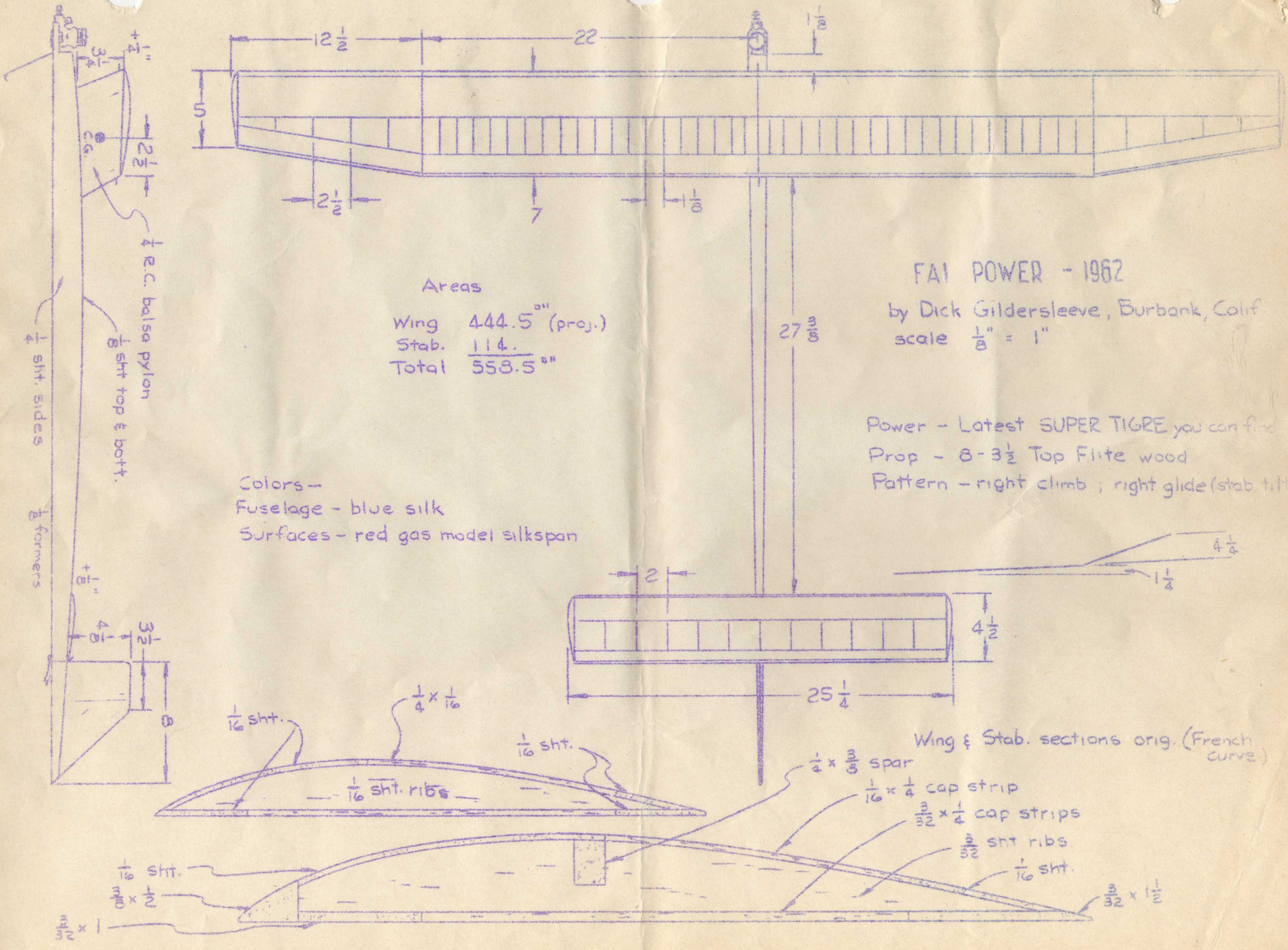
It is interesting and significant to note that by pushing the glider up, the speed of the plane is increased, and the towline is kept taunt.

The above discussion is based on theory and the figures for individual cases can vary. A practical check was performed by measuring the angle of towline gliders in photographs as they were released by the launching assistant. The values were: Jasco Nordic, 38°; an original, 25°. These values are within the area that is predicted by the theory.

FAI POWER MODEL -- 1962 by Dick Gildersleeve (SCAT club)

This design began to take shape back in '54 when Model Airplane News published an article ("Those FAI Gassies") which included a reference design chart to work from. (What's happened to articles like that today?) This layout of course was for the 17 oz. weight formula, and two ships were built; one with a Cub .14 and one with a K & B 15. They were quite an experience to fly, being slightly erratic for their small size.

Well, they didn't reach the Elimins that year, one being lost in the rain, the other wiped out at the Mirror Meet that year because of a warped rudder.



FAI POWER - 1962

by Dick Gildersleeve, Burbank, Calif.

scale 1/8" = 1"

Areas

Wing	444.5 sq" (proj.)
Stab.	114.
Total	558.5 sq"

Power - Latest SUPER TIGRE you can find

Prop - 8-3½ Top Flite wood

Pattern - right climb ; right glide (stab tilt)

Colors -

Fuselage - blue silk

Surfaces - red gas model silkspan

Wing & Stab. sections orig. (French curve)

Soon after that I was out of school and into the Air Force. After discharge in '58 I began building again. I was flying at the time with Frank Ehling, who I must give credit for the wing and stab construction. For a flat section it's fine. It can be built from the bottom of the wing up and is quite rigid expecially for high aspect ratio wings.

The layout is now a little longer, and this model flies quite easily for me. On the first time out, with a little negative in the stab to get a decent glide, she climbed right (high pylon) and glided the same. No thrust adjustments or rudder tabs are used. This ship has made everything quite simple for me to "get started" again in FAI power

COMING NEXT MONTH

For the May issue we've rounded up some goodies once again. Bob Wiehle will present his pretty pylon Nordic; Glenn Kinney, of the famous New England Wakefield Group, will present some ideas on thermals; and...but shucks, there won't be any surprises if we tell you everything!