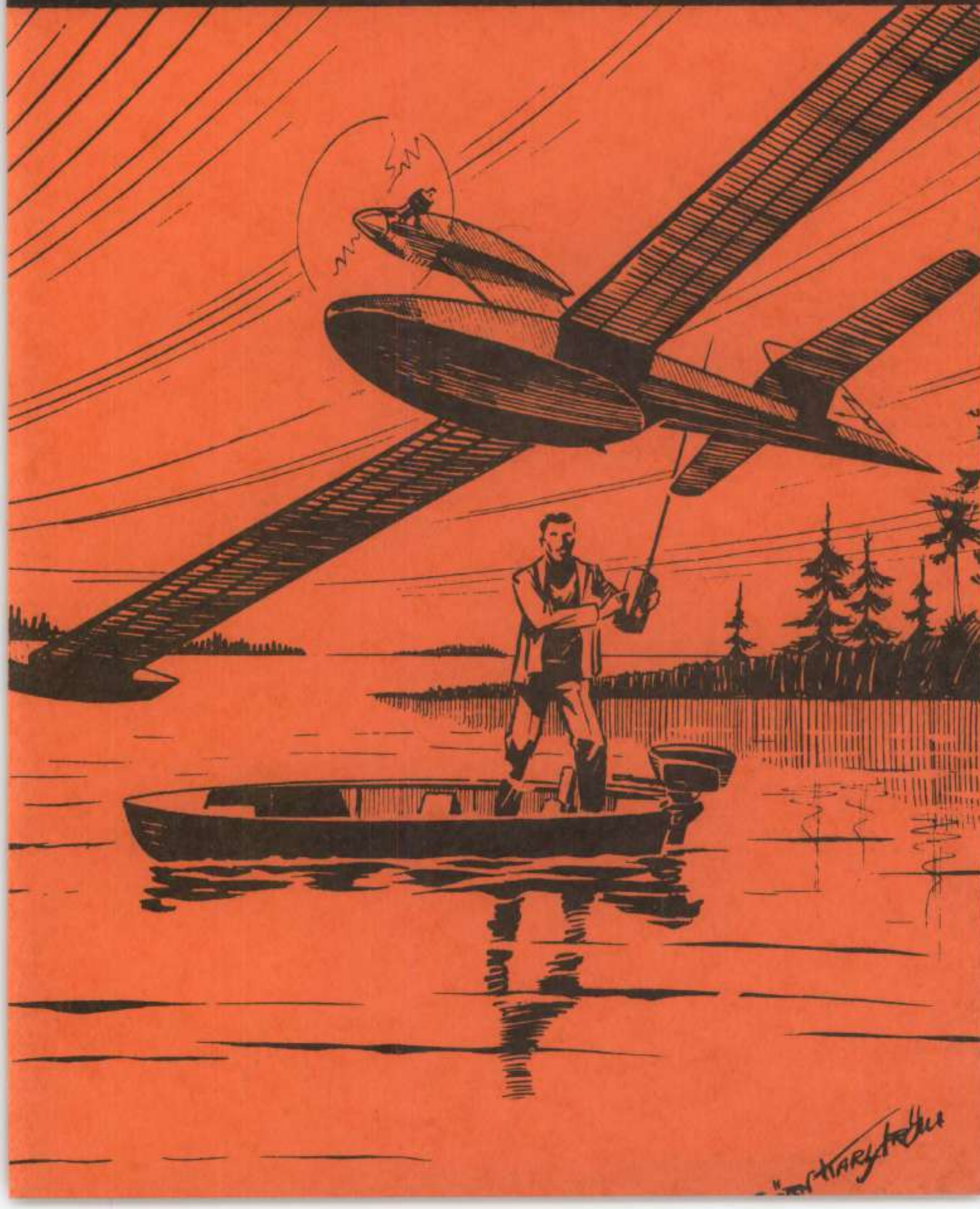
1957-58 MODEL AERONAUTIC YEAR BOOK

by Frank Zaic



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MODEL AERONAUTIC

YEAR BOOK

Edited by
Frank Zaic

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to Carmen

Past, Present and Future

All of the pleasures and joys that we experience while we build and fly model airplanes are being handed to us by those who were here before us.

All of the knowledge that we may find in this book we will take for our own, and feel that it is our right to do so. It truly is our right, if at the same time we assume the responsibility of eventually adding to the sum total of human knowledge. How could a fountain stay alive if we all dipped our cups in it and no one took care that water will continue to flow?

Pity the man who will take and use the knowledge gathered by others and does not contribute his own. He will miss one of the finest feelings of life, the glow that comes from bringing light into a corner that has been dark since time began.... And that which he holds so tight to himself will eventually be rediscovered someday, someplace by someone else.

May, 1958
Clifton Heights, Pa.

Frank Zaic

NOTES ON R/C FLYING

by Frank Bethwaite ——————————— New Zealand

The cliff soaring articles—both in yours and M.A.N. seem to have started the technique in New Zealand, Eastern Australia, and on your own West Coast. But there's a rub, and here is where I would like your advice.

Any*one* can build a model, install a radio, and fly it in good condition. We all know that. But when the weather gets tough, something gives. It may be the model runs out of performance. It may be the radio gear is too critical, and begins to miss controls. Or it may be the modeller who is unable to control properly under mounting stress and makes mistakes.

The real fun of flying for records, as I do, is that despite the best selection of conditions, once the model is up, the weather often changes and one finds coditions quite different from anything previously experienced. Sooner or later something gives, but there is always a lesson from it. Recently, it has been me that has given up first.

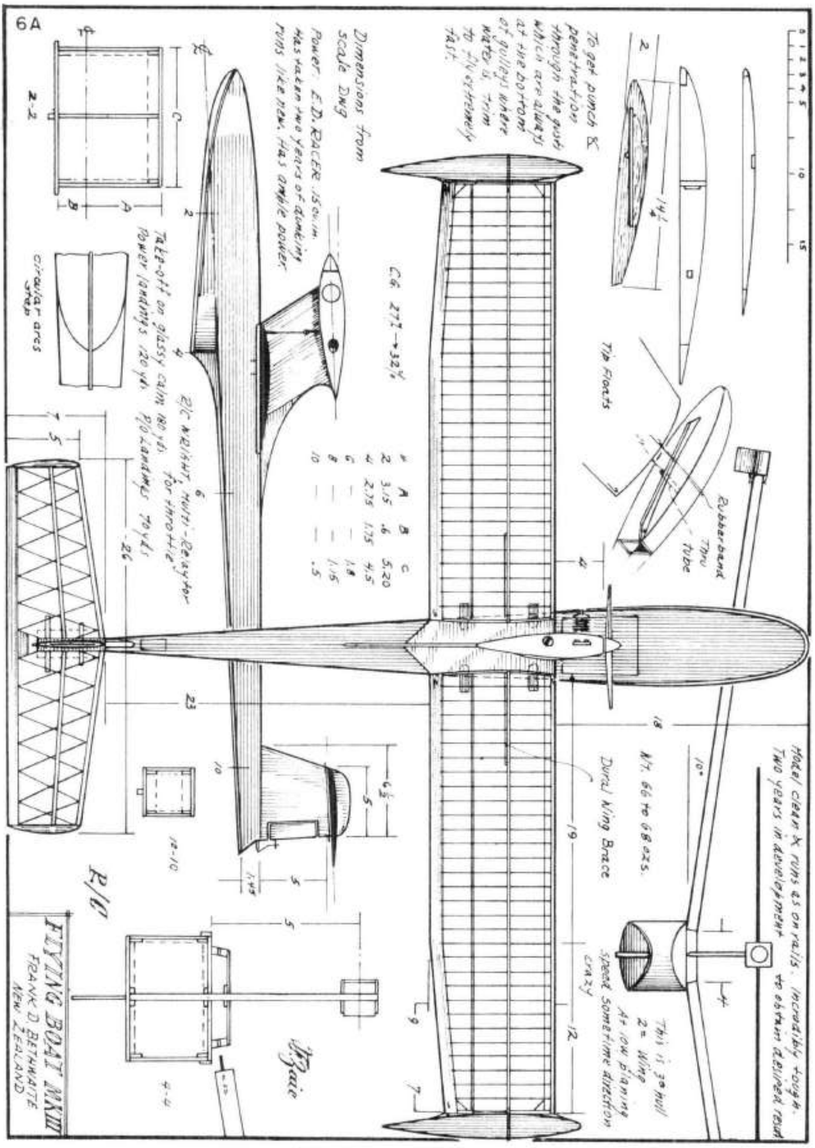
These last few months have been a lot of this. I tried three times to raise Dr. Chase's 8 hr. 41 min., but I came unstuck in severe weather once at 4 hrs., and twice at about 1½ hours.—once in severe turbulence and once in rain. Also, for the past year I have beee working up an R/C flying boat, using rudder and throttle control. I have been flying it all over N.Z. and Sydney despite its earlier shortcomings. This boat is fast and potent, and I fly it mostly in a small bay surrounded by high banks and trees and amongst moored boats. I've got away with it for a full year, but every time I give it to a friend to get time on, it out-runs him and fetches up smeared against a cliff. Again, it is the modeller who has given first.

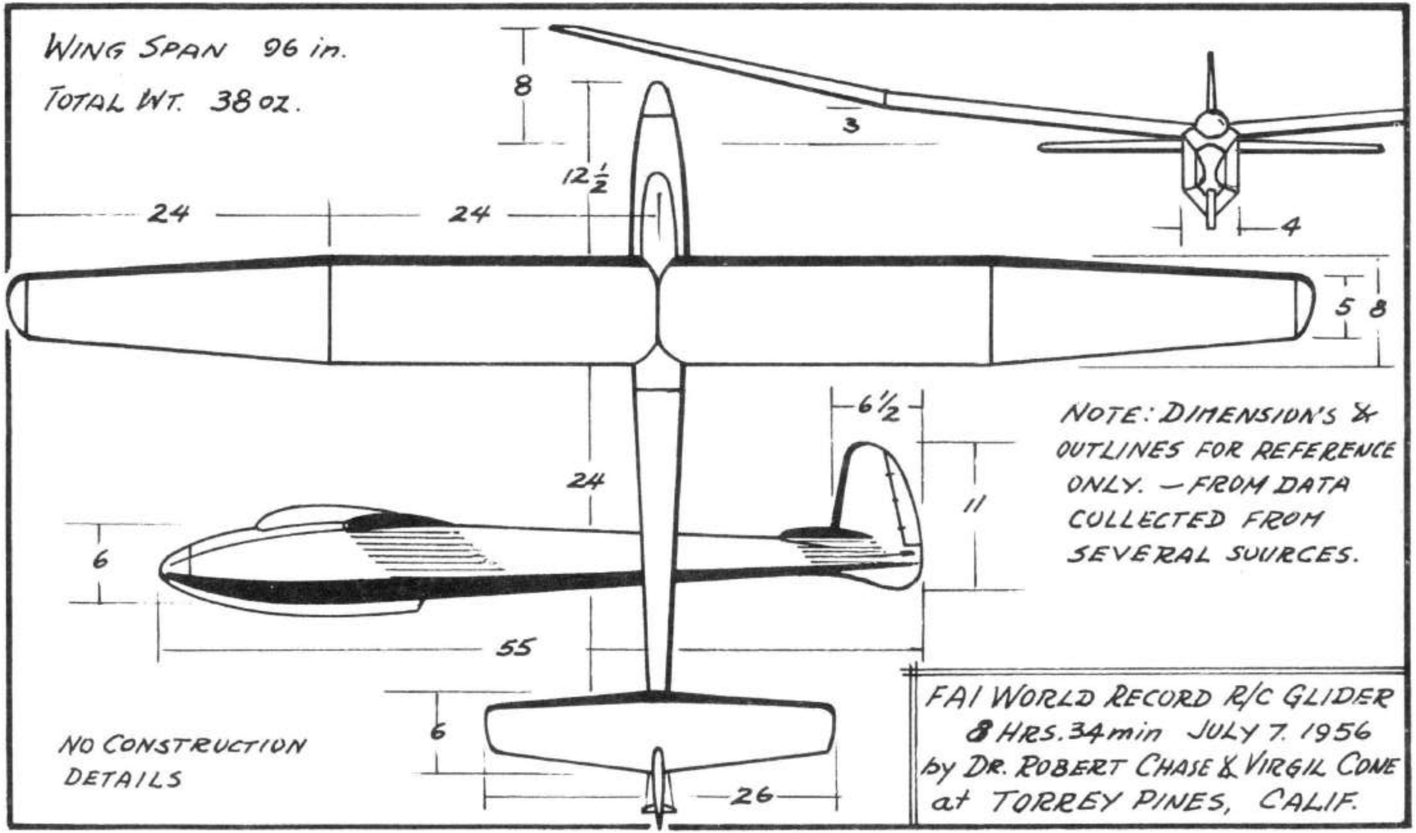
The moral of all this is that the control method is far too difficult for the ordinary modeller. We use left-centre-right centre:—I believe you call it "sequence" control. We have tried "Bonner" on both large plane models and on small very fast ones, and rejected it because it was just too slow (even speeded up to the fastest pace at which one could be certain of selection) to do the things we wanted to do. A recent visitor to N.Z., Carl Schmaedig, tells us that we have developed "rudder-only" sequence control far beyond anything he had previously seen. So, it may be that we are accustomed to controlling the models very closely and quickly by overseas standards, and have no qualms about flying in conditions and places which would be unsafe with slower operating gear.

In your letter you say ". . . the number of controls you can pack in . . . Yet I watch the models get into awful positions."

Do I gather from this that the same problems—the model out—running the modeller's ability to control it (basic design notwithstanding) is a feature of your flying too? More precisely, is it a feature of some systems but not of others?

Would you care to let me have your thoughts about this, some time, please? There are so many possible ways one could move to help cure this problem, and I have no experience save in our own sequence (plus pulse for 2nd control) and limited experience with Bonner. You probably see ten times this many systems. Which ones, if any, really keep working, in the sense that the modeller keeps the model doing what he wants it to do when conditions get tough.




WING SPAN 96 in.
TOTAL WT. 38 oz.
8
3
12½
24
24
4
5
8
6½
11
24
6
55
6
26
NOTE: DIMENSION'S & OUTLINES FOR REFERENCE ONLY. — FROM DATA COLLECTED FROM SEVERAL SOURCES.
NO CONSTRUCTION DETAILS
FAI WORLD RECORD R/C GLIDER
8 HRS. 34 min JULY 7. 1956
by DR. ROBERT CHASE & VIRGIL CONE
at TORREY PINES, CALIF.

R/C DEVELOPMENTS

by Harold DeBolt ——————————— Williamsport, N. Y.

Lately I have had time to think a bit about R/C and what has been going on. It all sure amazes me to no end. Just 2 years ago we were all struggling to add elevator control and hope for engine control too, we did have our model designs pretty well in line but that was about all. 5 channel systems were in their infancy and the people who were having success with them could be counted on the fingers of your hands and their success would have to be considered without perfection. Even single channel had yet to obtain real reliability and any second control from it was only had in a hit and miss fashion.

Today, just 2 years later the picture seems completely changed. The answer to it all seems to have been audio tone control, once the possibilities of this phase showed themselves things seemed to progress by leaps and bounds. With the use of tone equipment single channel has become as reliable as the old home broadcast receiver and along with it the lighter weight we have looked for has somehow made itself present too. Now, we have transistors and it looks as though we can soon do even much better. A review of what is available for multi-control use shows about as broad a scope of reliable equipment as one could ever dream of.

The main problem now for the modeler is no longer a hope of having additional controls, for now he worries about just which type will give the results he wishes. He can have a simple single channel radio and obtain reliable secondary controls from it or if he wants more selectivity he can go to the new and really wonderful dual-channel systems which come very close to 5 channel operation without the complexity. Should he demand the very ultimate there is available equipment which will give him most any number of channels which he might wish, all completely separate and a weight for the most complex which is just slightly above the old single channel rigs and very, very much more reliable. He even has a choice if his pocket book happens to be thin, single and dual channel rigs are offered at prices which any modeler can stand these days. When you realize that he can choose the type of multi-channel operation too such as proportional, simultaneous and even a combination of both it becomes really fantastic indeed. If the military does not watch out the modelers will be passing them before too long!

Along with the radio equipment has come actuator advancements too. Naturally, this had to be if the new radios were to be of any use. The reliability and performance of these cute little power packages is some thing to truly marvel at when you consider how little energy is actually available and used by them.

The main two problems with actuators were fundamental and seem well under control now. Weight has not been serious from the beginning but it may start to enter into the picture now with the advent of so many additional controls and the desire to have independent operation. The main problem has been reliability, and this has been a rough row to hoe. Strangely enough a great deal of the problem is not in the machine itself, rather it is with the operator's ability to handle it under all stress conditions, and, even more important, to understand them and to maintain them in the fashion necessary for reliability. Fortunately the time seems to have arrived when constant machine improvement has gradually cut down the importance of the human element, as a direct result we have actuator reliability.

The second problem has been the need for sufficient actuator power. Many did not realize just how much power was actually required to operate a model's controls and the by products which effect an actuator through these controls was not even known to exist! Today these things are pretty well known. Power was no particular problem with the motor driven types right from the start but design changes did have to be made to combat such things as reverse air loads and speed of action which raised their ugly heads as time went along.

The rubber driven types did have major power problems and still do have in some rather isolated cases. However, tremendous progress has been made with these types too and a lot of trouble spots have been cured. They remain as the cheapest means of operating a control and it is hard to see where an electric device will ever replace a 2c piece of rubber from the cost angle. At this time there are still great advancements to be made in the proportional types of actuators, usable types are available but the ultimate seems yet to come. It would seem that the greatest advancement will come with these in the future.

As a so-called model designer I feel sort of naked when it comes time to look into model advancement in these two years. Frankly, there just has not been anywhere near the improvements; at least nothing radical enough to get excited about. 2 years ago we were flying symmetrical wings successfully and doing after a fashion, when the equipment allowed, the same things as are going on today. The big advancement seems to be in the quantity of this flying. Many more have switched to semi and symmetrical airfoils during that time. The things which we foresaw then seem to have come true today. These new airfoils have improved general performance besides adding maneuvers that were nearly impossible wih the flat bottom types.

The key to advancement seemed to be lower wing loadings. Fortunately, the new equipment gets lighter with progress and this, plus more seemingly simple advances in model design and construction, have allowed much lower wing loadings. The result is that the models continue to look similar to those before but that is the least of it. Close examination shows a much lighter ready to fly aircraft and numerous improvements in structural details. In a couple of cases I have seen high performance models which are carrying considerably more than their own weight in R/C equipment without the slightest sacrifice in performance. That is an achievement that even full scale can look on with considerable thought.

It had been thought that a good rugged long lasting model needed plenty of structural beef to stand up. This theory seems outdated by these new ideas as the ruggedness seem to have improved intead of our loosing it. The answer seems to lie in mass enertia and associated forces. The lighter ships just don't hit as hard as the old style. The enertia of lighter structural weights is less with the result that they tend to bounce rather than disintegrate. A good example of it is pictured in Dwight Hartmans NATS movies where he caught one of these new style jobs actually bouncing around on the concrete runway with no apparent damage, something to think about!

What advancements in model design that have been realized were made along the same lines, to get the loading down. In a great many cases it was found that the average R/C design could stand some additional wing area without detracting very much if anything from its stability. In the case of a popular kit a wide spread change was to increase the area from just over 5 sq. ft. to a full 6 sq. ft. by increasing the chord by 1 inch and adding an inch to the span. No other changes were required except that for contest performance the engine was usually jumped from a .19 to a throttle equipped .29. As a result performance increased considerably as the added area was to the peak side of the performance curve, so to speak. In general this could be said to represent the general trend, at least in monos. One advantage of it became immediately apparent, take off ability increased to perfection. The difference seemed to come from the added power and increased lift which allowed the model to get off quicker and before it had a chance to run afoul. In the air the performance improved to the extent that many maneuvers could now be done from level flight which required a rather ambitious dive before. One point worth noting was that in spite of the greater lift and lower wing loading the built in flight controls of the design, still functioned well with the result that there was no loss of penetration or added ballooning effects.

It seems to have become apparent also that there is a minimum dihedral angle which we can go to in models after which performance has to suffer. Numerous attempts were made to use less than 5 degrees but none seemed to have the inherent flyability that 5 degrees offers. One better answerto the lateral stability problem may be to raise the C.G. while maintaining the 5 degrees, no apparent losses occcurred with this approach.

Of course with the more widespread use of symmetrical wings the wing loading problem became more critical. It would seem that it has now been proven that to equal a flat bottom foil rate of sink, a symmetrical foil must be flown at a considerable lighter loading, say 10 oz. for a symmetrical to equal a flat bottom at 15 oz. Another symmetrical problem was speed, however this seems to have been controlled automatically. With the symmetrical foil; area was increased to be able to equal the heavier loaded flat section.The added area seemed to create just enough more drag so that the speed would be on an equal basis.

One answer to the wing loading problem was the change to a biplane. Here it was found that a tremendous amount of area could be added with very little increase in the overall weight of the model. Actually it was found that 70% more wing area could be added while increasing the total weight by only about 11% which of course was a simple way to solve a nasty problem. There were other advantages also for the Bipe. It allows a rather small overall size model which is capable of carrying equipment that would require a mono of double the size and power to equal in performance. With the desire for so many additional new controls it seems most probable that we are in an era where the Bipes will become more popular for this reason alone. Very few seem to like the effort which must be put into the bomber size R/C ships. Another apparent advantage of the Bipe was greatly improved maneuverability over the comparable monoplane. For the first time we had a model which could maneuver so sharply that it was on the verge of tearing itself apart in the turns! These really spectacular close hauled maneuvers did not seem as pretty to watch as they would be if they were just a bit larger, so another first was scored when it became necessary to reduce the amount of control action in order to cut back on performance! No apparent weakness has been seen in the Bipe as yet, they are simple to design force-wise, they are compact to handle and they fly very steadily; that is until you ask them to do something, then things really happen!

It would appear that we may be on the verge of a new look in models and that they will be more complex than ever before with performance that will come very close to the many dreams we have had. With many models underway that will duplicate exactly all full scale controls in a very usable manner, it looks as though a considerable number of flyers will be in for a pretty full flying season just learning to use them all. Once they are accomplished, flying should take another great step forward, perhaps close to the ultimate for the type of models which we have today. Right at this moment the grapevine says the following controls are required if you are to keep up with the Jones's. Semi or proportional rudder; trimmable and self-neutralizing elevators; semi-proportional engine control; steerable tail wheel; positive acting brakes; differential operating ailerons working together with the rudder and a good set of wing flaps. With these things a guy is supposed to be in with the "boys" but who knows what the grapevine may have overlooked?

R/C NEWS FROM DOWN UNDER

by Don Wilson ——————————————— New Zealand

Radio flying occupies all my modelling time now, which is not as much as I would like, and I find that flying and maintaining three or four R/C models is just about a full time occupation. My next project is a delta for R/, to serve as test hack for a possible R/C speed-record attempt later on. Should be exciting, if nothing else.

You will know, of course, of Frank Bethwaite 7½ hour effort with his sailplane earlier this year. We feel that this time will take some cracking. However, we have our eyes always open for suitable weather, and will try to better it given the chance. Likewise the present 3¼ hour power R/C record held by Russia.

Frank's next model will be for R/C power duration and should do the trick after we get to know it. His latest effort is a beautiful R/C flying boat with rudder and engine control, and it is a joy to fly it. My first four flights with it resulted in no more than five feet difference between the four landing spots, which, even if I say so myself, is a pretty good average. This model will give us both a lot of pleasure this summer, I am sure.

We are interested out here to see how R/C is developing in the U.S.A., especially multi-control. The commercial gear, to us, seems a whale of a price to pay, but your experts must get the desired results from its use. We are tending to stay as simple as possible, using just single channel carrier sets, with the obvious restrictions of only one control at a time. However, Les Wright is hatching out some new circuits I think, and I know that easy multi-control for the average flyer is his aim.

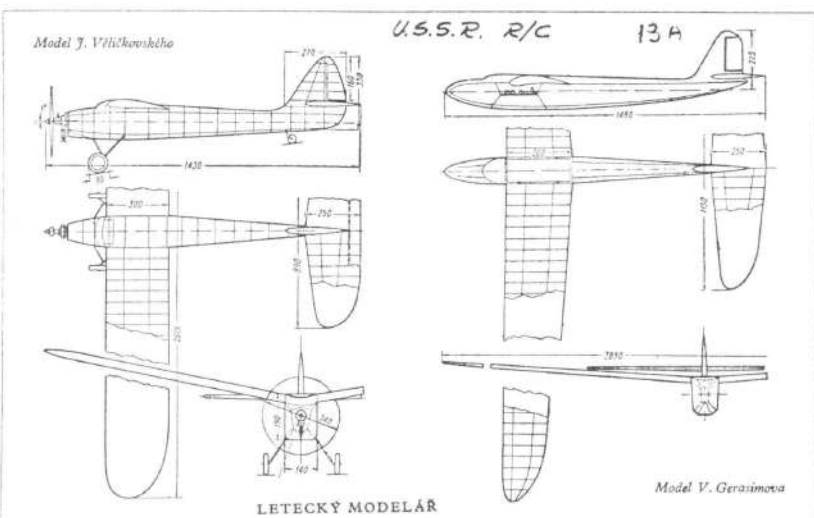
I am quite sure that his present equipment cannot be beaten for reliability and most R/C people here seem quite content to leave the new development work to Les. Most of his time for the past year has been on his factory production problems, especially LP records, but I believe that the present discs are equal to the world's best in microgroove.

I see that the latest Wakefield results are out, and feature Russian names near the top. If we out here could only fly our own models personally in the Wakefield, what a difference it would make to us. Transport of models from here is a major business and they invariably seem to arrive late or at the wrong place now. I think that we would have a full team in Australia in person, if the contest could have been held there following the Alan King's win in U.S.A. However, the FAI in its wisdom decided not, but we will never quite forgive it for that decision. Anyway, the FAI is rapidly killing the clan by its frequent rule changes, so what the heck?

I have little personal news of interest, Frank; somehow, we all seem to have been rushing around this summer, and have not had our old "get-togethers" so often. Wind is always a bug bear in this country; New Zealand is only about the size of California, and is smack across the "Roaring Forties" of sailing-ship fame. Once I used to fly, wind or no wind, but not now. Time is too precious and radio models too valuable and complex to risk needlessly. So if it is too windy to fly, I just change my plans and do something else. After all, there is always another week-end in five days which might be O.K.

Frank is keen to have another go at the R/C sailplane record. He wrote to the California, Bob Chase, who beat his record by almost an hour—new time 8½ hrs.—and received a most cordial and interesting reply. The next couple of months are probably the most suitable for the desired wind conditions here, so Frank will probably be making a serious attempt soon. It will be a marathon!

About the R/C Delta. Results confirm overseas reports, and this type of model is really most stable and smooth in flight. To my eyes, though, a delta still looks "wrong" in the air, with my preconceived ideas of conventional aircraft. However, my own experience has convinced me of their 100% practicability as a model, and I hope to build another more ambitious delta in the future. There seems to be a good deal of local interest in deltas just now, and a temporary batch of such models will probably result.



LETECKÝ MODELÁŘ

MULTI R/C DESIGN

by Claude McCullough ——————————— Ottumwa, Iowa

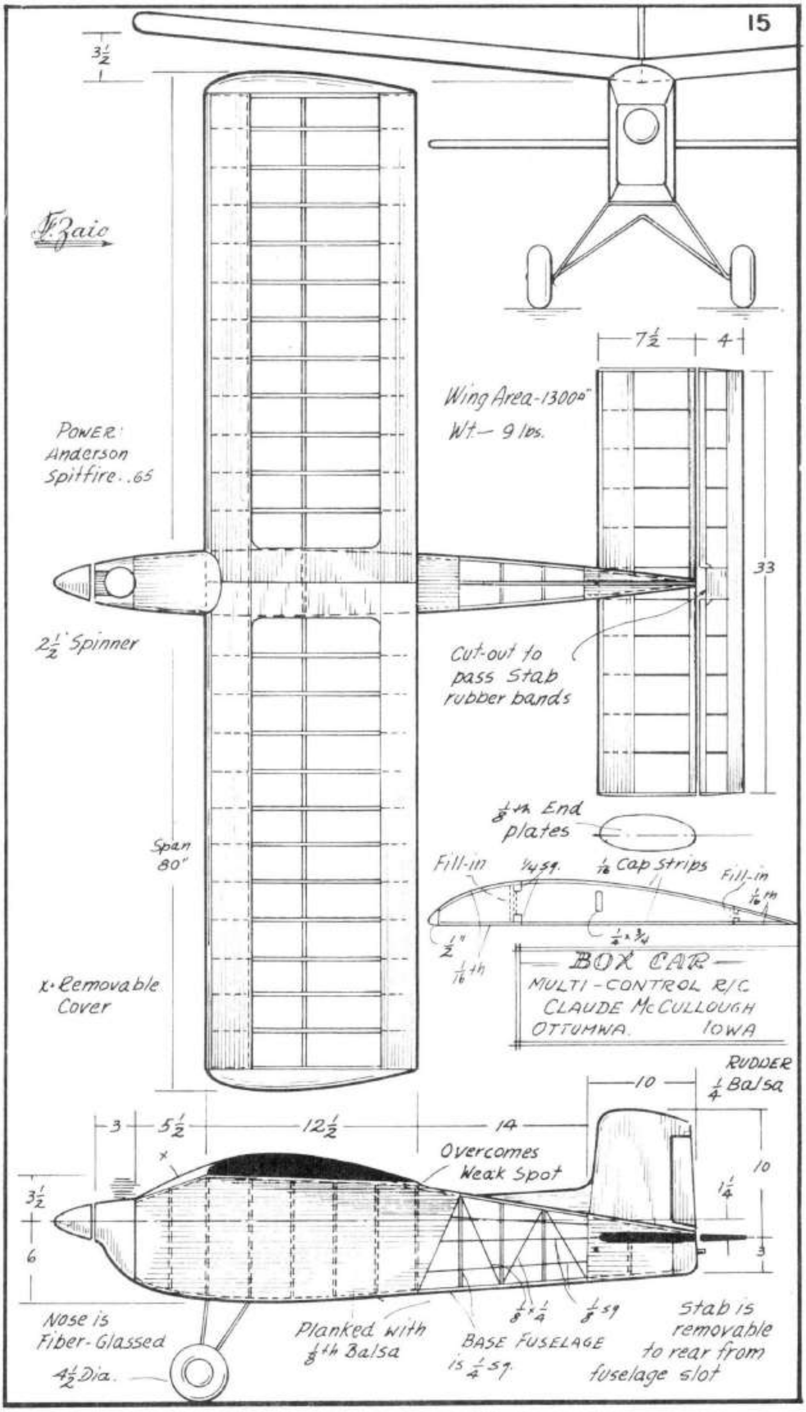
For sport flying or non-complicated contest work I have always preferred a high wing loading, not only because a rugged ship can take punishment but also for wind bucking and smoother, non-bouncy flights. However, when it comes to the type of performance common in multi-control events nowadays—inversion, rolls, outside loops, etc.—there is simply no good substitute for a low wing loading.

Boxcar was designed to have as much wing area as could be reasonably packed into an ordinary automobile. Using a very low A/R gave about 1,300 sq. inches and contributed to excellent maneuverability. This short coupled type of design also proved efficient from the standpoint of keeping weight down. Although the structure was built without skimping and packed full of batteries and equipment the total weight was a reasonable 9 lbs.

A deep cabin provides plenty of room for any type of gadget and space to get at them for adjustments. Large control surfaces were chosen since I believe they deliver smoother maneuvers than smaller areas. A big elevator is particularly necessary to outside loop a lifting wing section, in this case a deep Clark-Y based airfoil. The lifting force available is noticeable in a hand launch—the ship will fly right away without dislocating your back.

Low loading is a wonderful aid to takeoff characteristics so I didn't go wheel-happy for once, keeping a simple two wheel gear well back from the L. E. Tests with several length gears have convinced me that a long one with high ground angle gives a quicker, smoother ROG than a short gear, and is easier on props as well.

Power is also an important factor on takeoff. I have found no .60-.65 as reliable as the Anderson Spitfire and it has plenty of brute force and takes speed control perfectly, something that some engines in this class are not noted for. I see a lot of ships that could use more power on high speed. I've gone to three-speed, with high really whining to get off quick and climb after maneuvers. Medium is used most of the time in the air, set to maintain or barely gain altitude. Low is adjusted as a descending speed for touch and go, etc.


F. Zaic
POWER:
Anderson
Spitfire .65
2 1/2" Spinner
Span
80"
x - Removable
Cover
Wing Area - 1300□"
Wt. - 9 lbs.
7 1/2
4
33
Cut-out to
pass Stab
rubber bands
1/8th End
plates
Fill-in
1/4 sq.
1/16 Cap Strips
Fill-in
1/16th
1/2"
1/16th
1/4 x 3/4
BOX CAR
MULTI-CONTROL R/C
CLAUDE McCULLOUGH
OTTUMWA IOWA
RUDDER
1/4 Balsa
10
3
5 1/2
12 1/2
14
Overcomes
Weak Spot
3 1/2
6
10
1 1/4
3
Nose is
Fiber-Glassed
4 1/2 Dia.
Planked with
1/8th Balsa
BASE FUSELAGE
is 1/4 sq.
1/8 x 1/4
1/8 sq
Stab is
removable
to rear from
fuselage slot

RUDDER AND/OR AILERON CONTROL

by Dr. Walter Good ——————————— Bethesda, Md.

I believe the question between aileron and rudder control is beginning to clear a bit. I like to look at the problem as follows:

1. RUDDER CONTROL—

Rudder Control banks a model simply because the rudder deflection causes a yaw which in turn causes the dihedral to roll the model. Actually, the design conditions of a rudder model are nicely met if the model is "spirally stable." This means generous dihedral and small fin. The MULTIBUG uses 7 degree dihedral in each panel and has a 6% fin. Such a model will recover rather rapidly from a turn upon neutralizing the rudder. By the same token, holding a small amount of rudder is necessary to hold a steady turn. Such a ship as the MULTIBUG will do a rather nice slow roll, on axis, simply by holding full rudder and pumping the elevator down and up at the right time. Of course, the ship is in a constant yaw during the whole roll and the dihedral is the actual roll producer.

2. AILERON CONTROL—

The use of ailerons to produce roll is very effective, but there is a secondary action due to the drag of the down aileron (adverse yaw). If the ship is spirally stable then, by definition, its directional stability is weak and the dragging aileron will cause a yaw angle. The yaw brings the dihedral into play and it produces a roll which is "opposite" to that produced by the ailerons. Thus it is possible for an aileron ship to start a very rapid roll which quickly slows down due to the opposing dihedral.

In theory it is possible for the roll to actually reverse but I have never seen this in a practical case. I believe I have observed this variable roll rate in the SMOG HOG (Howard Bonner) equipped with ailerons. The SMOG HOG is a high wing design with about 5 degree dihedral per panel so it has a fair degree of spiral stability and is usually steered by the rudder. Therefore when ailerons were added some of the roll opposition effect should be expected.

The interesting point here is that a ship which steers well by rudder control will not do too well with ailerons. Or, saying it another way, an "aileron ship" should possess a "weak or zero spiral stability" so that the yawing does not produce roll recovery (or at most a very weak recovery). This shows up remarkably well in the ASTRO HOG (Fred Dunn) design which is a low wing with weak spiral stability.

It steers easily with aileron, and rolls rapidly and smoothly with ailerons, but try to steer with rudder and ugh! the ship yaws violently and finally works into a very jerky turn.

Another example is a recent plane by Gene Foxworthy. His approach was to use a shoulder wing with low dihedral (less than 2 degree per panel) and a moderate fin area such that the ship would hold a turn in either direction with controls in neutral; weak spiral stability. He then steered with a mixture of aileron and rudder both linked to the same servo. In fact he used a "single" aileron and was able to do smooth rolls in either direction. I would guess his design would fall intermediate between a pure rudder hip and a pure aileron ship.

Still another way of looking at the aileron ship is that its directional stability is large and hence the aileron drag cannot cause a large yaw and hence what little dihedral effect exists cannot produce much roll.

I have probably over-simplified the situation but I really believe that our ideas are pretty close together. I did find an NACA report which helps on the dihedral and fin area basis. It is:

NACA Technical Note No. 1094—"Experimental Determination of The Effects of Dihedral, Vertical Tail Area, and Lift Coefficient on Lateral Stability and Control Characteristics." By Marion O. McKinney, Jr., July 1946.

He flies an unpowered model in the free flight tunnel with dihedrals that vary from -20 degrees to -18 degrees and fin areas from 0 to 35%. He also tried both rudder and aileron control, separately and in combination. Very interesting.

Another reference which has a lot of good basic info is a text called:

"Airplane Performance Stability and Control" by C. D. Perkins and R. E. Hage, date 1949. Published by John Wiley & Sons, Inc., New York City.

The book is written for the aeronautical engineer and uses the Math rather profusely, but I am sure some of the R/C Fliers would like to know about it.

Our DC/RC is putting on an AMA RC Technical Conference here in Washington on April 12 and 13th. One of the papers will be by Don Hewes of NACA on the subject of rudder and aileron control.

Just back from a California trip where the generous Larks (Bonner and Dunham) let me fly their famous ASTRO HOGS, hence the first hand reference to the above.

RUDDER, ELEVATOR AND AILERON

by Frank Zaic —————————— New York, N. Y.

Most of us use rudder for turn adjustments and take it for granted without bothering to know how it does the job. As for the aileron, about the only use we make of it is when we warp wings for flight adjustments. But with R/C flying becoming more like full scale, time has come to become acquainted with rudder and/or aileron turn control. Free flight fliers can also profit by knowing the limits of each method so that a particular control will not be forced to do a job it cannot do.

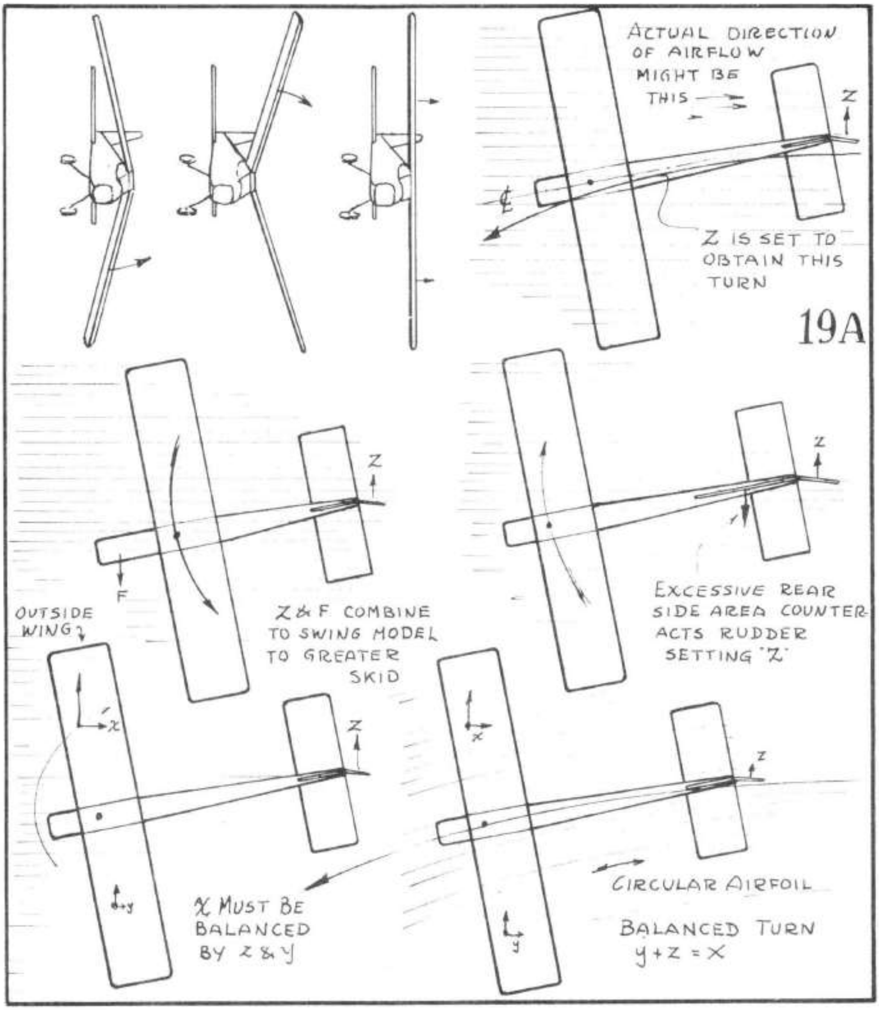
RUDDER CONTROL

When a rudder is set for a turn, it tends to swing or skid the model so that its center line is no longer in flight path. What happens next depends on the layout of the model. This can be best seenby looking at the model along the flight path and note the elements which are affected by the side exposure to the air flow.

The side area of the model will determine how effective the rudder is in swinging and holding the model in a skid. If the area effect is almost balanced about the C.G., the rudder needs only slight effort to swing the model into a skid. But if the area effect behind the C.G. is strong, the rudder will need a larger area as well as greater setting to counteract the rear side area and hold the model in desired skid. And if the area effect is strong ahead of the C.G., the rudder setting may be just enough to make the model practically swing 180 degrees around.

The next check along the flight path is the wing. If the wing is flat, it has relatively no influence on the position of the model in skid and the above reaction will take place. But if it has a dihedral angle, the change can be great. If dihedral is negative, the model will have a tendency to roll in direction opposite to desired turn, and very likely just tumble out of control. With a positive dihedral, the resulting roll will be in the desired turn. The amount of roll will depend on the dihedral angle and the ability of the rudder to handle counter-turn-force generated by the dihedral effect. This is an important point and needs greater detail.

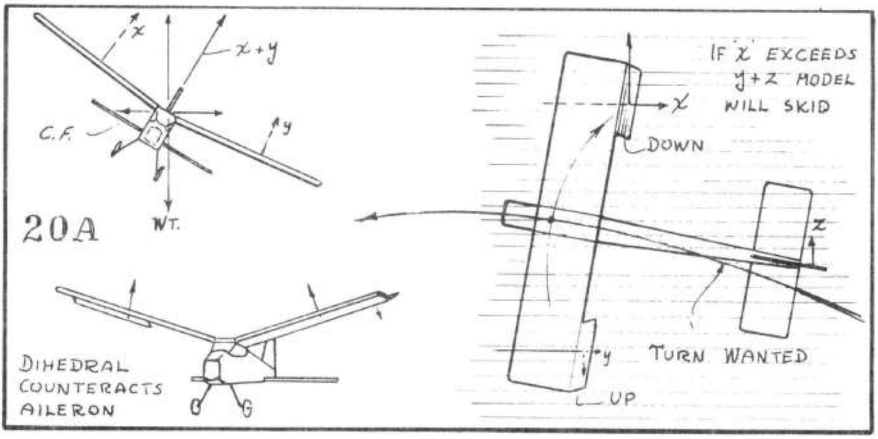
When a wing with a positive dihedral angle is set in a skid, the wing halves will have different angles of attack. The "outside" wing has more, and the "inner" has less. The lift and drag values will follow suit. So that the "outside" wing will have greater lift and drag values than the "inner" one. The lift values we can utilize in causing the model to roll, but the drag values can give us trouble. It is obvious that the drag value of the "inner" wing is less than that of the "outer" one, with the result that the remaining drag value (after balancing the "inner" drag) of the "outer" wing will tend to work in opposition against rudder. As long as the rudder force is greater than the excessive drag of the "outer" wing, the side skid will be increased until rudder force and "outer" wing drag are balanced. And, conversely, the side skid angle will decrease if the "outer" wing drag is stronger than the rudder force until a balance is reached. From this it can be seen that excessive rudder control can force the dihedral effect to roll the model into a vertical position. While excessive dihedral, in combination with small rudder, can hold the model almost level with practically no roll assist. for turning.



19A

After the turn is established, the model may ease out of the side skid attitude. This is partially done by the "outside" wing travelling at a higher speed and so generating more lift without the benefit of dihedral effect. And the rudder setting is also minimized by the "Circular Airflow" effect. It is quite possible that the model may now have very little or no side skid angle after it establishes a uniform turn pattern. However, this particular point needs greater clarification in details for convictions, one way or other.

The reason for utilizing the dihedral effect is to cause the model to roll when rudder is applied. The reason or need for the roll is to bank the model so that a portion of its lift can be used to counteract the centrifugal force which is developed when the model begins to circle. Without this side force, it would be impossible to obtain smooth circling, if any, no matter how much rudder is applied. So we may say that the rudder sets in operation a series of sequences which end by having the model banked so that part of its lift is used for counteracting the C.F. during the turn.



AILERON CONTROL

An Aileron by itself can be just as useless as the rudder without dihedral effect. It needs help from other elements. In principle, the ailerons are used to cause the plan to roll and so present part of the lift as counterforce for C.F. The depressed aileron half of the wing generates more lift than the other half, causing the plane to roll. The problem lies in the fact that the depressed aileron, while producing greater lift, also produces greater drag. This drag will tend to swing the model into a yaw or side skid in direction of the turn without the benefit of rolling. In fact, if the model has a dihedral, its action will be to counter the work of the depressed aileron. So, where is the gain? The solution, obviously, is to have side area effect extra powerful behind the C.G. so that any tendency toward side skidding will be quickly corrected or held to minimum.

So, here again, we see that the size of rudder area (in sense that it is side area behind the C.G.) will determine the effectiveness of the aileron control. Small rudder, relatively speaking, will make aileron turn control practically useless. While a large rudder area will provide an almost automatic assistance to the aileron. In fact, a large fixed rudder in combination with movable aileron will provide turning action similar to full scale rudder/aileron combination. Note that in an aileron skid the airflow against the rudder is similar to rudder set for a turn.

The story of circling or turning is a long one and it can become complexed. We have only covered the general mechanics of how a turn is developed with rudder and/or aileron without considering other forces involved as well as changes in the aerodynamical balances which occur when flight path is changed from a straight path to a circular one. Some examples:

Although rudder may be large enough in area and have large angular movement to force the model into a very tight circle, the rest of the model may not be properly coordinated to do this. And if the model is forced into a tight and highly banked circle, it may not be able to generate enough side lift to counter the C.F., and at the same time lose its longitudinal balance due to the "Circular Airflow" effects, and spiral dive out of control without being able to correct it with reversed rudder setting. Then we have effect of the power thrust line which can affect the final outcome, depending on the type of cotrol. So, you see, it can be fun!

R/C may give many of us an omnipotent feeling of power to circumvent all petty little things like aerodynamical trifles, but comes the day of reckoning when all sorts of frantic button pushing will not be able to overcome one of the little aerodynamical trifles which has been pushed just a bit too far. It is a good rule to remember not to push a model and its ability or inherent stability, if we want to avoid spiral dives. Of course, this implies that you will recognize the symptoms that every model displays just before it goes temperamental.

To us, R/C presents a wonderful opportunity to investigate all sorts of aeronautical problems peculiar to model design and flying. And we hope that many of you will eventually become blase about stunt flying and do some serious experimental work.

FLYING WING CONTROL

The aileron control can be very nicely demonstrated on flying wing designs. As any one who has tried flying wings can attest, the natural tendecy is to warp one of the wing tips down when a turn is desired. The reasoning being that the down warp or wash in will provide extra lift which will roll the model into a bank in the development of a turn. The surprise comes when the actual circle turns out to be just opposite to expectations. As it has been demonstrated, the higher angle of attack besides giving higher lift, also generates higher drag. With practically no side area behind the C.G. in flying wings to act as counter force area, the drag of warped wing tip will naturally lag behind and so cause the unexpected turn. Therefore, it would seem that the logical turn control for flying wings is to have "drag" vanes on the tips.

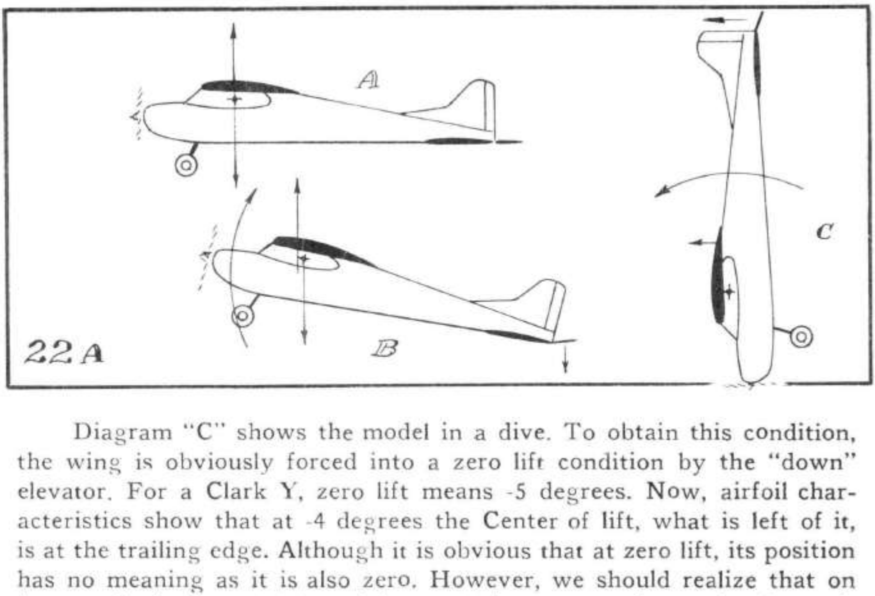
The above action will also occur on any model whose side area is balanced about the C.G. or favors front, and the warping of the wing is used for "turn" control.

"And very little "down" elevator is needed for a dive," is a statement usually said in surprise (because the "up" elevator takes a lot of movement before action takes place). But is the nature of airplane design that only a slight "down" elevator brings rapid and violent action.

The reason that a "down" elevator is seemingly so effective can be traced to the characteristics of the wing, in particular, the Center of Lift movement with change of angle of attack. This can be best described by referring to the diagrams.

Diagram "A" shows a model in a level flight with wing and stab-elevator balanced. Note that the lift of the wing is centered over the 35% point at which the C.G. is also located. In this position the stab-elevator has neutral action.

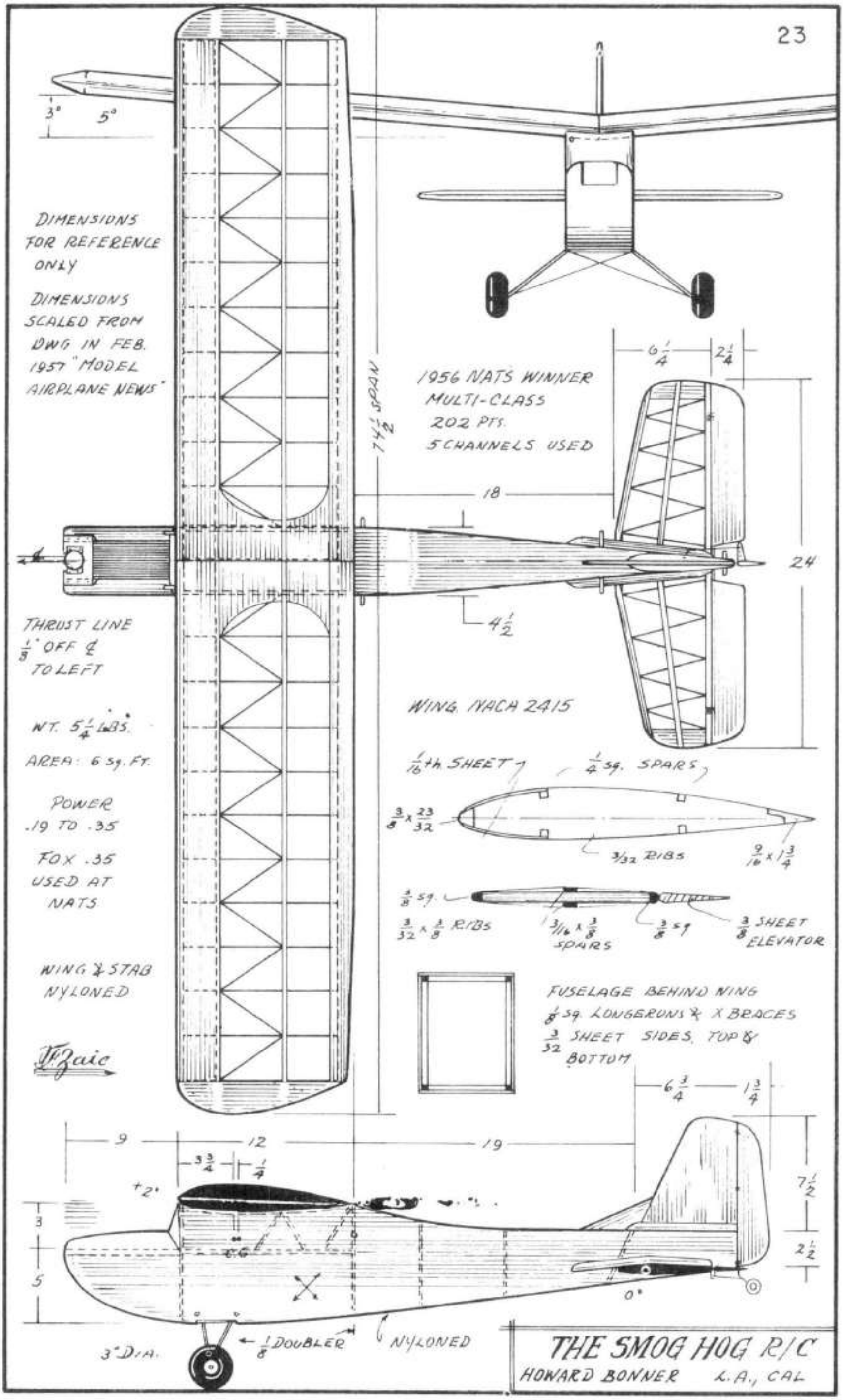
Diagram "B" shows the model forced into 8 degrees by the "up" elevator to obtain climb or loop. Note that the wing's lift has shifted slightly ahead of the C.G. and that it's helping the "up" elevator action. However, the wing's effort is not enough to worry about.



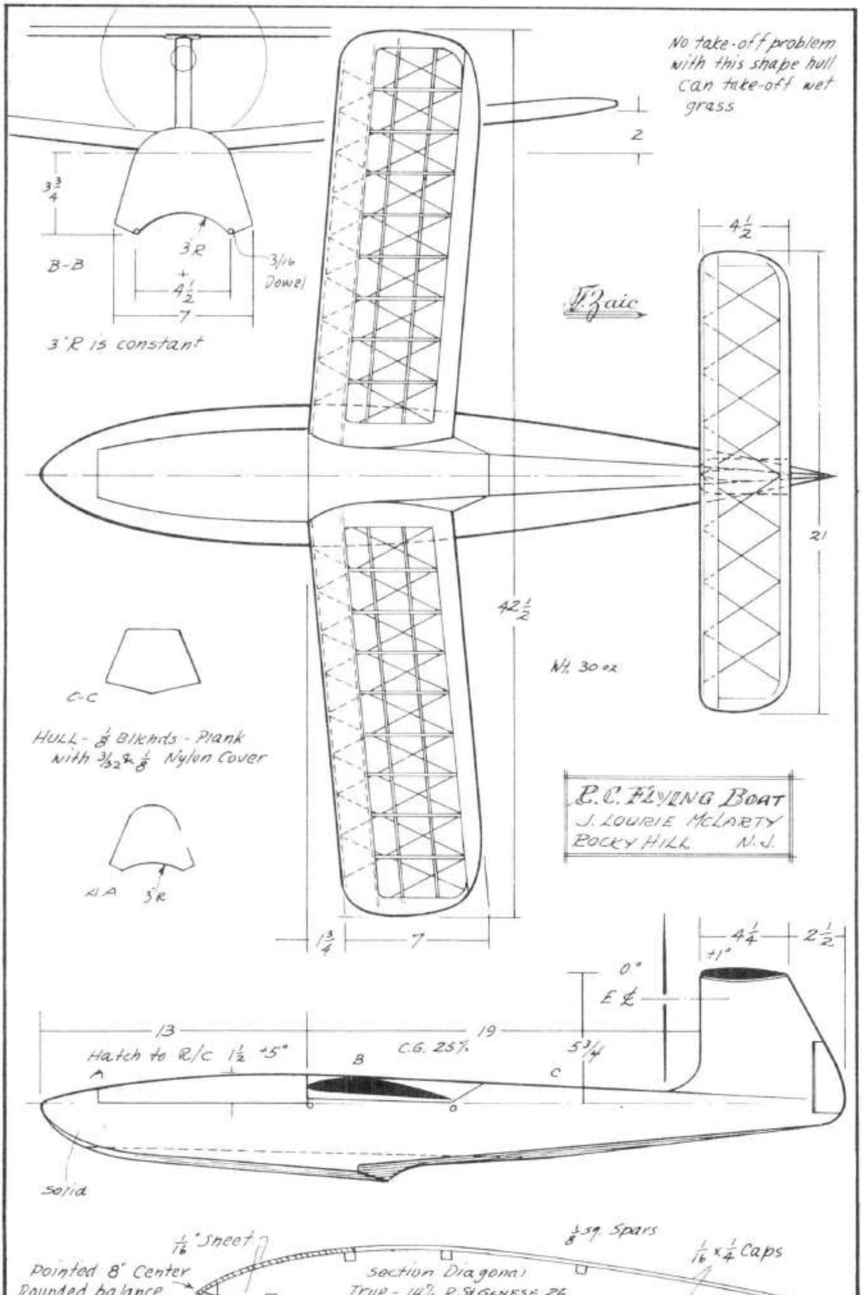
22A

Diagram "C" shows the model in a dive. To obtain this condition, the wing is obviously forced into a zero lift condition by the "down" elevator. For a Clark Y, zero lift means -5 degrees. Now, airfoil characteristics show that at -4 degrees the Center of lift, what is left of it, is at the trailing edge. Although it is obvious that at zero lift, its position has no meaning as it is also zero. However, we should realize that on its way back, from 35% position at 4 degrees as the angle of attack moved towards -4 degrees, the Center of Lift moved backward to 100% or trailing edge point. And that as soon as it moved from the 35% C.G. point, the Center of Lift tended to dive the model around the C.G. point. Or we might say that its moment about the C.G. helped the "down" elevator bring the model into lower angles of attack.

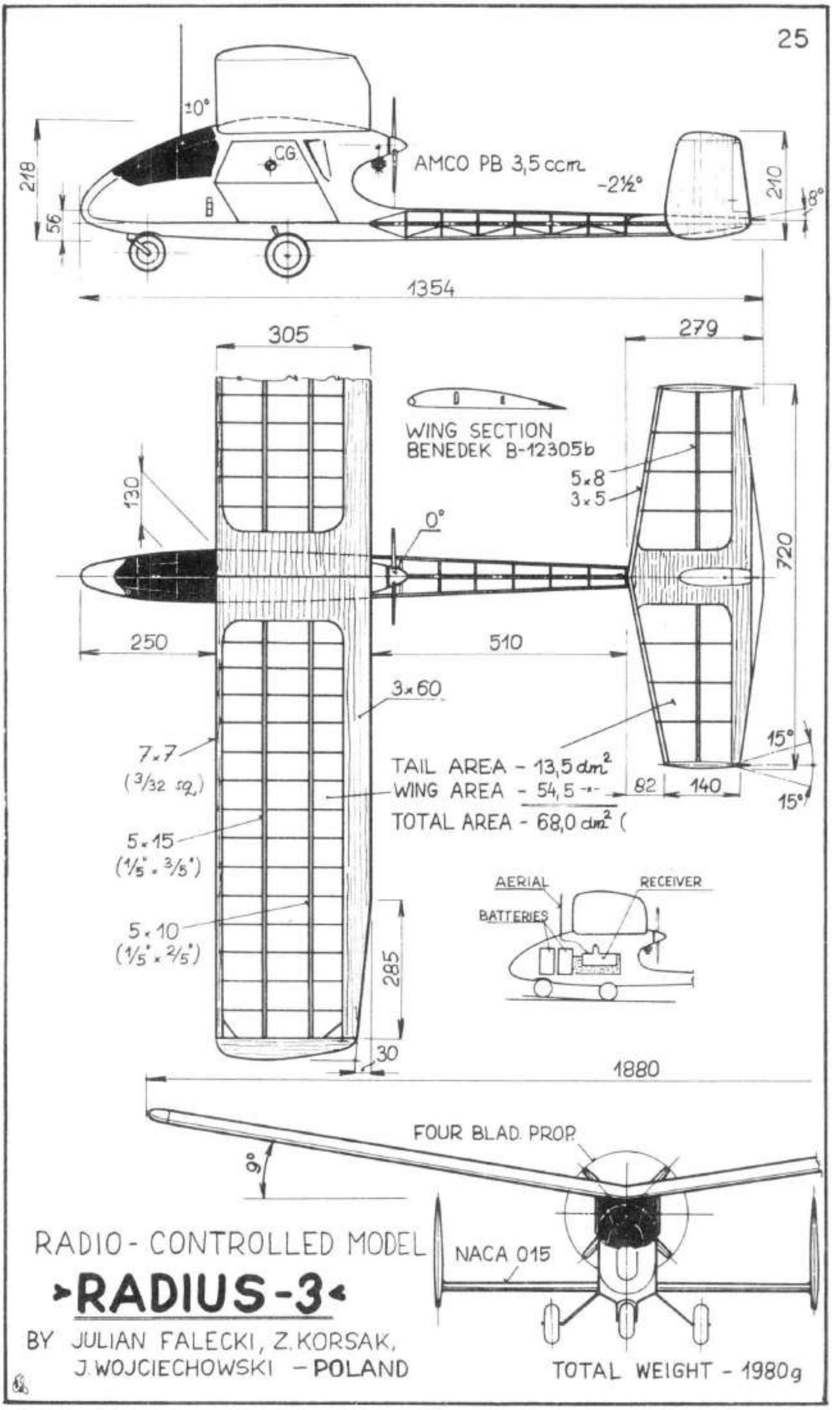
So, next time, a "very little down" elevator gives you "lots of down" action, just remember that as soon as you start the "down" elevator, the airfoil characteristics jump into action and help it dump the model into a dive, no questions asked.

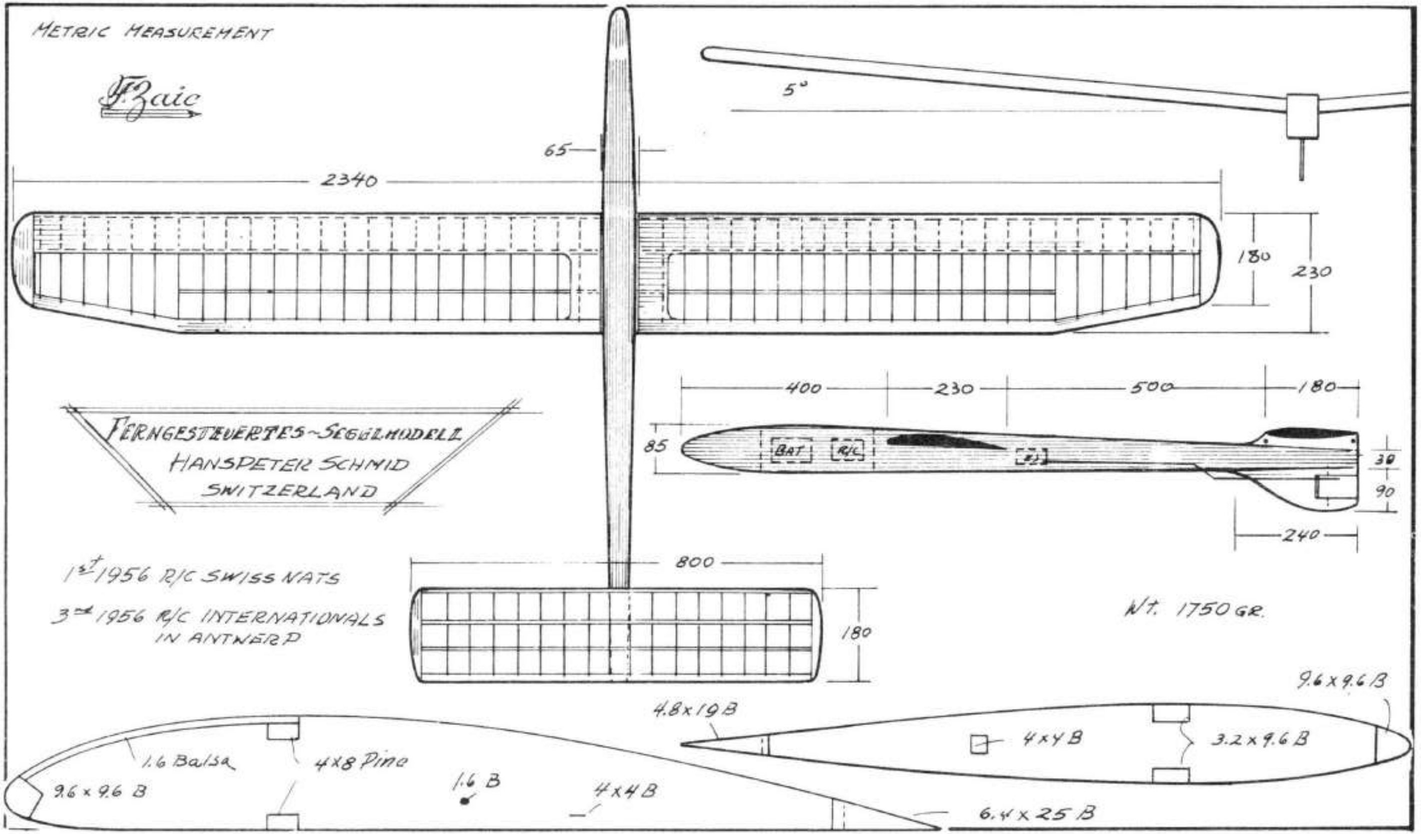


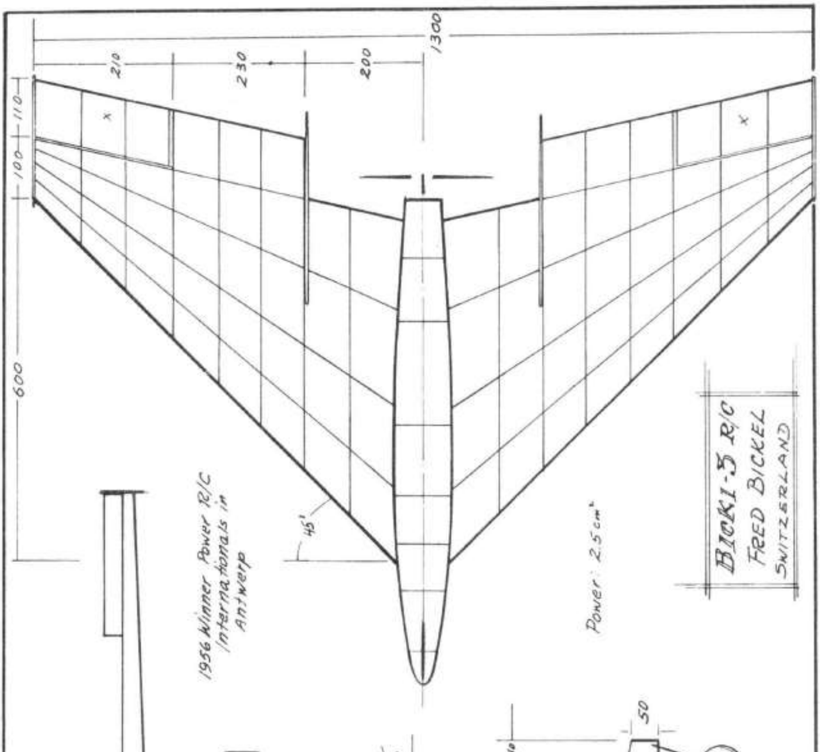
3°
5°
DIMENSIONS FOR REFERENCE ONLY
DIMENSIONS SCALED FROM DWG IN FEB. 1957 "MODEL AIRPLANE NEWS"
74 1/2 SPAN
1956 NATS WINNER
MULTI-CLASS
202 PTS.
5 CHANNELS USED
6 1/4
2 1/4
18
24
4 1/2
THRUST LINE 1/8" OFF ℄ TO LEFT
WT. 5 1/4 LBS.
AREA: 6 SQ. FT.
POWER .19 TO .35
FOX .35 USED AT NATS
WING NACA 2415
1/16th SHEET
1/4 SQ. SPARS
3/8 x 23/32
3/32 RIBS
9/16 x 1 3/4
3/8 SQ.
3/32 x 3/8 RIBS
3/16 x 3/8 SPARS
3/8 SQ
3/8 SHEET ELEVATOR
WING & STAB NYLONED
FUSELAGE BEHIND WING
1/8 SQ. LONGERONS & X BRACES
3/32 SHEET SIDES, TOP & BOTTOM
Zaic
6 3/4
1 3/4
9
12
19
3 3/4
1/4
+2°
3
5
C.G.
7 1/2
2 1/2
0°
3" DIA.
1/8 DOUBLER
NYLONED
THE SMOG HOG R/C
HOWARD BONNER L.A., CAL

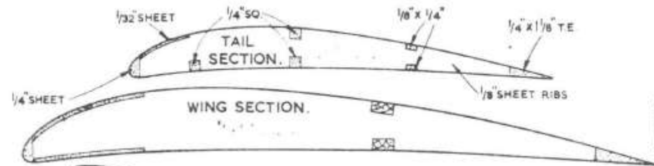


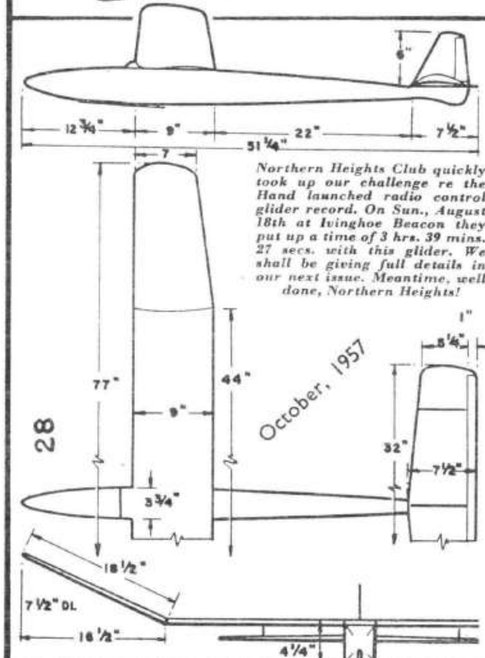
No take-off problem with this shape hull Can take-off wet grass
B-B
3R
3/16 Dowel
3"R is constant
C-C
HULL - 1/8 Blkhds - Plank with 3/32 & 1/8 Nylon Cover
A A
3R
Wt. 30 oz
R.C. FLYING BOAT
J. LOURIE McLARTY
ROCKY HILL N.J.
Hatch to R/C
C.G. 25%
E ℄
Solid
1/16" Sheet
1/8 sq. Spars
1/16 x 1/4 Caps
Pointed 8" Center
Rounded balance
Section Diagonal
True - 14% R.St.GENESE 26


±0°
218
56
CG.
AMCO PB 3,5 ccm
-2½°
210
8°
1354
305
279
WING SECTION
BENEDEK B-12305b
130
5×8
3×5
0°
720
250
510
3×60
7×7
(3/32 sq.)
TAIL AREA - 13,5 dm²
WING AREA - 54,5 -"-
TOTAL AREA - 68,0 dm² (
82
140
15°
15°
5×15
(1/5" × 3/5")
AERIAL
RECEIVER
BATTERIES
5×10
(1/5" × 2/5")
285
30
1880
FOUR BLAD. PROP.
9°
NACA 015
RADIO - CONTROLLED MODEL
›RADIUS-3‹
BY JULIAN FALECKI, Z. KORSAK,
J. WOJCIECHOWSKI - POLAND
TOTAL WEIGHT - 1980g


METRIC MEASUREMENT
F. Zaic
65
2340
5°
180
230
FERNGESTEUERTES-SEGELMODELL
HANSPETER SCHMID
SWITZERLAND
400
230
500
180
85
BAT
R/C
30
90
240
800
1st 1956 R/C SWISS NATS
3rd 1956 R/C INTERNATIONALS
IN ANTWERP
180
Wt. 1750 GR.
9.6 x 9.6 B
4.8 x 19 B
1.6 Balsa
4 x 8 Pine
4 x 4 B
3.2 x 9.6 B
9.6 x 9.6 B
1.6 B
4 x 4 B
6.4 x 25 B


1300
600
210
230
200
100
110
45°
1956 Winner Power R/C Internationals in Antwerp
Power: 2.5 cm³
BICKI-5 R/C
FRED BICKEL
SWITZERLAND
Tip Plate
15°
8% Clark Y
560
200
50
40
140
170
100
330
150
Control Rudder
Metric Dimensions From Scale Drawings

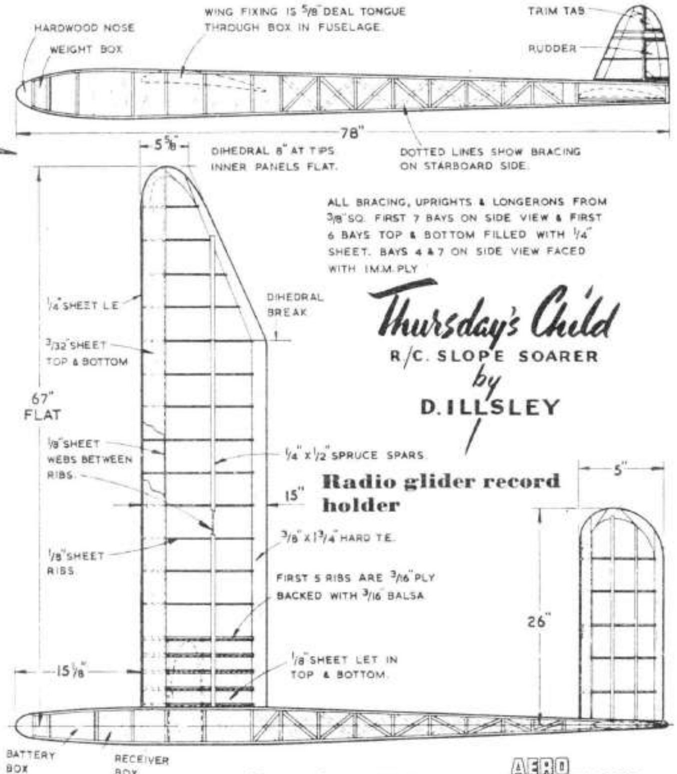




Northern Heights Club quickly took up our challenge re the Hand launched radio control glider record. On Sun., August 18th at Ivinghoe Beacon they put up a time of 3 hrs. 39 mins. 27 secs. with this glider. We shall be giving full details in our next issue. Meantime, well done, Northern Heights!

October, 1957

Readers will be interested in details of D. Illsley's current British Record Holder, "Thursday's Child", a slope soaring radio-controlled sailplane of 11-ft. span which established at Dovedale on the 21st April, 1957, a new record with a time of 2 hrs. 23 mins. 19 secs. Transmitter is a three-valve crystal controlled unit with vibrator supply from 12-volt car battery. Receiver uses the Graupner circuit with Sigma relay which was the only type found reliable for 15 hours non-stop operation at 2 cycles per second. Model was launched from a 500-ft. ridge facing South West and was whisked up in a cold front to 1,500 feet over the site in the first ten minutes, the next hour being spent battling for height in a light breeze. Remaining time was flown in rain with an ideal wind which stopped every time the rain ceased! Fred Vale was the other partner in the team on the radio side, and Messrs. Monks, Perry and Reid did stalwart work timekeeping. Considering all concerned made a round trip of over one hundred miles every time an attempt was made we can safely say this record was well earned. What about it Northern Heights!



Thursday's Child

R/C. SLOPE SOARER

by

D. ILLSLEY

Radio glider record holder

VERY HIGH THRUST LINE (VHT)

by Stanley D. Hill —————————— Santa Barbara, Calif.

If I were to generalize about these "High Thrust Line" jobs I would say that they are a little easier to fly, not nearly as critical to handle high power without resorting to such power wasting practices as tight spiral climbs.

As long as the wing is in the prop wash the resulting lift and increased downwash onto the stab bring about a looping tendency that must be compensated for by use of downthrust or (less desirable) thicker stabilizers. The "Very High Thrust Line" jobs with the wing out, or nearly out of the prop wash are trouble free on this point and have no looping problems at all. There are a few very successful jobs with wing, engine and stab on the same line but seem to require almost fantastic thrust offsets.

Too many modelers have failed to pay attention to the rolling and yawing moments induced by slipstream rotation—due, I suppose, to the predominance of only one basic type model. Change to HTL to VHTL type forces an awareness of these effects and their resulting flight patterns. HTL models with the fin in the slipstream will normally climb to the left and tend to dive if turned to the right under power. Those with the fin outside the slipstream are sill rather "leftish" but can turn right under power safely.

The greater the amount of wing, fuselage, fin and stab area within this spiral flow of propwash, the more positive will be these effects on the model's characteristic flight pattern.

Realization of this prompted development of the "Hammerhead," a VHTL job with only a forward fin, (Austrian style) which served as an engine support, getting any prop wash at all. Torque plus wash on the fin still gave a left climb but a small rudder tab permitted straight or even right climb with safety.

Putting the rudder back on top in the wash countered the small left tendency; resulting in a beautiful straight climb that used all the power in going up—way up. No downthrust is needed on these VHTL models yet they still have reasonable decalage of 3 to 5 degrees when trimmed for a straight climb. Stab tilt is the only turn source, and C.G. is in the 70% to 80% range.

Ossie Czepa has tried this same "engine-on-forward-fin" set-up and from what I hear had very superior results. His has fin both above and below the thrust line, effectively canceling yaw and roll moments due to prop was on the fin.

Have lately been trying very long stab moments of from 50% to 75% of wing span (30% stab and 6 degree tilt) and this, in combination with the engine-on-fin set-up, has produced the most docile and predictable yet very high performance jobs I have ever seen.

Decalage on these VHTL models does have to be greater than on a low thrust line one to prevent nosing over under power. As far as I am concerned this is a desirable feature as it gets away from those dangerous "knife edge" trims of 0 to 2 degrees. Because of this, C.G. will be carried from 5% to 10% farther forward than on a low, medium or high thrust line job attempting to fly the same pattern.

The figures in the thrust line location effects chart are obviously generalizations that do not take into account all possible variations of lateral area distribution, C.G., etc., but it does show the basic relationship fairly well.

As I see it, these "High Thrust Line" models have one big advantage—that of being able to have a knife-edge climb plus freedom from knife-edge stability. As you mentioned, a quick pitch-moment calculation shows a good margin of safety obtainable in no other way.

I have done nothing but "High Thrust Line" jobs for about 13 years, in firm belief that it is the answer. Finally, others are beginning to find that it works and are "coming over to the other side of the fence."

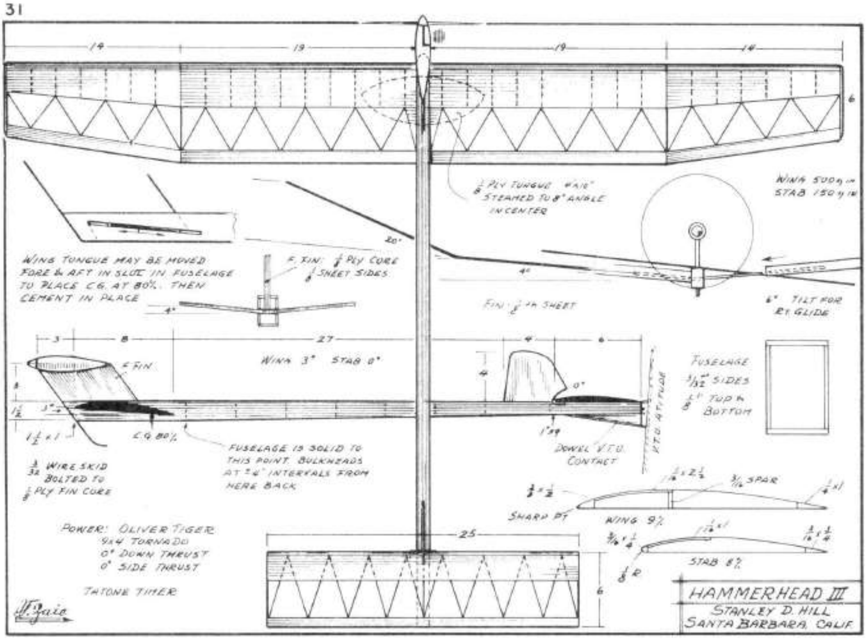
VHTL and Downthrust have a lot of effects in common, but as flight and engine speed varies more and more the similarity decreases. Of the two, VHTL is much easier to predict and control; the prop wash is free. But on a high degree downthrust, there is a lot of stuff sticking out or into the prop wash.

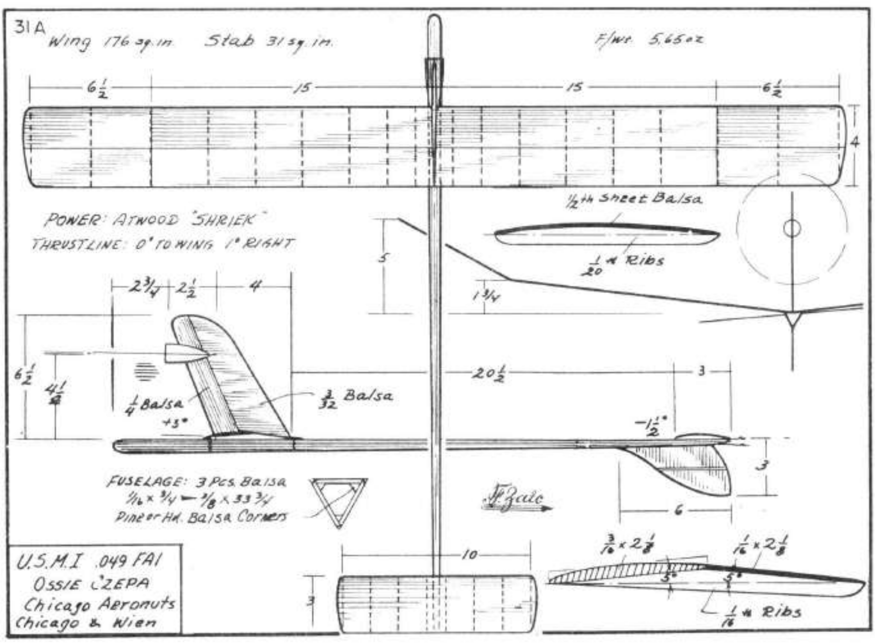
Not that there is much, but there is a bit more power available for climb on VHTL due to lower triangulation and drag (less of ship in prop wash) losses.

THRUST LINE	PARTS OF MODEL IN SLIPSTREAM	DOWNTHRUST	SAFE CLIMB	DECALAGE
ABOVE WING	FORWARD FIN AND RUDDER	0	St. L, Rt.	3° to 5°
ABOVE WING	FORWARD FIN	0	St. L, Rt.	3° to 5°
NEAR WING	FUSELAGE, WING AND RUDDER	3° to 12°	St. L.	1.5° to 4°
NEAR WING	FUSE., WING, STAB. & RUDDR	8° to 15°	St L, Rt .	0 to 3°
BELOW WING	FUSELAGE, STAB AND RUDDER	0 to 2°	R	0 to 4°

St.L.= Stab Tilt to Left

31


WING TONGUE MAY BE MOVED FORE & AFT IN SLOT IN FUSELAGE TO PLACE C.G. AT 80%. THEN CEMENT IN PLACE
F. FIN: 1/8 PLY CORE 1/8 SHEET SIDES
1/8 PLY TONGUE "A10" STEAMED TO 8° ANGLE IN CENTER
WING 500 sq in
STAB 150 sq in
6° TILT FOR RT. GLIDE
FIN: 1/8 th SHEET
WING 3° STAB 0°
F. FIN
C.G. 80%
FUSELAGE IS SOLID TO THIS POINT. BULKHEADS AT 4" INTERVALS FROM HERE BACK
DOWEL V.T.O. CONTACT
V.T.O. ATTITUDE
FUSELAGE 3/32" SIDES 1/8" TOP & BOTTOM
3/32 WIRE SKID BOLTED TO 1/8 PLY FIN CORE
3/16 SPAR
SHARP PT
WING 9%
STAB 8%
POWER: OLIVER TIGER 9x4 TORNADO 0° DOWN THRUST 0° SIDE THRUST
TATONE TIMER
HAMMERHEAD III
STANLEY D. HILL
SANTA BARBARA, CALIF.


31A
Wing 176 sq. in. Stab 31 sq. in.
F/wt. 5.65 oz
POWER: ATWOOD "SHRIEK"
THRUSTLINE: 0° TO WING 1° RIGHT
1/2 th Sheet Balsa
1/20 th Ribs
1/4 Balsa
3/32 Balsa
FUSELAGE: 3 Pcs. Balsa 1/16 x 3/4 — 3/8 x 33 3/4
Pine or Hd. Balsa Corners
1/16 th Ribs
U.S.M.I .049 FAI
OSSIE CZEPA
Chicago Aeronuts
Chicago & Wien

CHANGING MOMENT ARMS

by Pete Buskell —————————————————— England

About modelling, I have not found time for much of it during the past couple of years, but I have a few things that may be of interest for your new book.

First, you may remember my building a "SLICK STICK" of 4 in. shorter Moment Arm and finding some big changes in model performance? Well, I tried a few other lengths in an attempt to find what was happening.

Calling the original Length "X" I found that at X-1 in. glide stability deteriorated slightly and power handling improved a bit. Between X-1 in. and X-4 in. glide stability deteriorated very badly (having got a flat glide the ship would start stalling at a slight gust and built it up rapidly) and power handling was very much easier. At X + 1 in. there was a further flight improvement in glide stability but no noticeable effect on power. Further increase in length produced very little effect. I interpret these tests in the following way:

In shortening the M.A. I was moving the stabilizer into an area of strong down-wash (turbulent wake) and the effects of this are quite large when the C.G. is well aft. The power control improved because it was necessary to remove a lot of wing incidence to restore the glide turn.

On power, when the wing flies close to zero lift there is no down-wash and hence the angular difference is much less than for a long moment model. This may seem to point to using a short or moderate M.A. for handling high power, but I do not think so.

The key to success is I think, in a reliable model, and in this glide stability is of the utmost importance. Lack of it will manifest itself in poor transfer from power to glide and even more important in the ability to hook and hold risers and to ride it out smoothly in high winds.

On the debit side, if you can get the stab out of strong Down Wash area you will almost certainly need a low A.R. stab to control power.

These can be tricky if you want to do a normal take-off, on account of the ship building up too much speed before the nose comes up. With VTO or HL this worry disappears.

Getting the stab out of strong Down Wash area would appear to depend largely on practical experiment as conditions will vary widely for different sections and layouts. Generally, though, I think it would need to be a long model for a pylon layout. Other alternative would be to lower the wing (current low pylon trend) or put the tailplane high (structurally difficult but would go well with a layout using a few degrees downthrust).

One point where I would disagree with is in advocating downthrust as a means of trimming high power. Most people find it necessary to add about 10° before it has any effect. In actual fact, this 10° is quite a bit more. Taking an average sort of model with undercambered section around 9% thick, the ship will fly with the wing near zero lift which will occur at about -4°. Add 3° rigging to -4° and you have the fuselage -7° with reference to flight path. With 10° downthrust built-in, you are starting to waste quite a bit of power. In the example the actual thrust line is -17° to flight path during power.

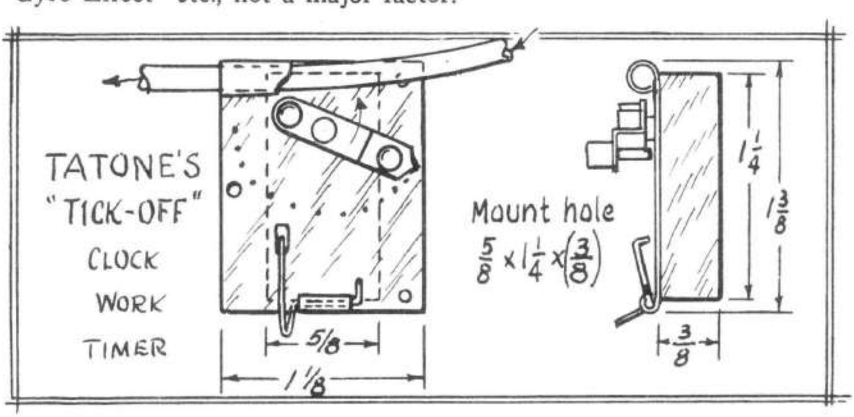
Currently over here, in FAI Power more and more people are carving their own props and breathing more than somewhat on the motor in an effort to get more blast, and not many find it necessary to use downthrust.

I have had quite a bit of trouble with my current design during the past year or so. I was not very happy with the ships I flew at Wiesbaden as they flew on too much right rudder and took a lot of trimming. In Wiesbaden the motors were new and I managed OK. Later they ran-in some and I could not handle the extra blast, either had a barrel roll at the start or a wind-in at the end of the run.

I built a light stab and chopped 2 in. off the nose (on advice of many people, it seems my old ship should not have flown at all! ! !) after this I could not trim it at all.

Spent most of the season trying new fin layouts and finally cleared things up by removing the underfin altogether.

But getting back to short nose, it is a thing many people say is a must for a good gas model. All it did for mine (apart from aggravating the above trouble) was to make the power turn very slightly more consistent for changes of power or prop (never worried me anyway) and make the glide recovery a little better in turbulent conditions. So it would seem that this "must" is in a similar class to "heavy props" and "Gyro Effect" etc., not a major factor.



TRAJECTORY STABILITY

by Alan C. Brown —————————— Los Angeles, Calif.

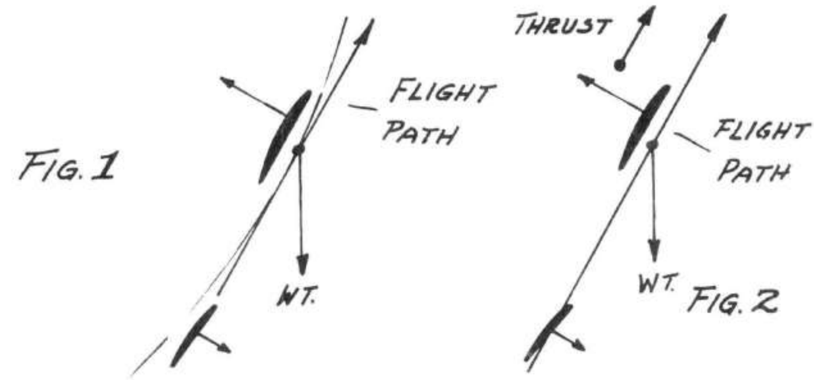
As you can see, I have changed my address by about 6000 miles, and have only now got settled down. I expect I shall have missed an opportunity of putting anything in the "57 book, but like the chance to talk over some of the items on trajectory stability with people who may have comments to make. I have done very little new thinking on the subject, but just recently have thought about power model performance, in particular with respect to the new F.A.I. rules.

First of all, it seems that with weights up to 25-30 ounces, and thrust for a good 0.15 not much different, it seems that we can think more about the glide, and not need to spiral so much to preserve our climbing stability. The description of obtaining optimum performance is simpler than for the rubber model, as the power duration is fixed, although, of course, it is more difficult to achieve the best possible duration. For the best time, we must get as high as we can on the power run, and have the best glide possible after that. This probably sounds very obvious, but we may as well state the facts first, and then see how to best achieve them.

Under power, we want to get as high as possible in a given time; so first we must go the shortest way, and second the fastest. The shortest way means no looping spirals unless it is absolutely necessary for trajectory stability. As the thrust/weight ratio is now near one, we can probably climb straight or very nearly. We obviously do not need a great deal of lift in this case, but must concentrate on reducing drag.

Now I am beginning to wander, although it is not a thing that can be satisfactorily calculated because of a lot of unknown aerofoil properties, whether we ought to go to a wing section with better glide characteristics. The model is not going to climb as fast as under previous rules, so maybe we do not need the low drag sections which are not quite so good on the glide.

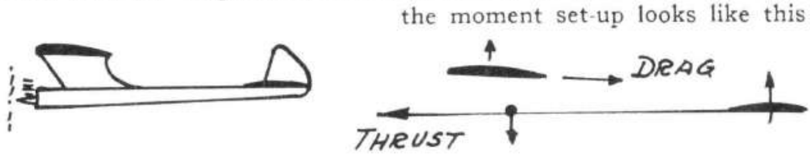
Still, to get to the climb, we are stuck with the thrust and weight. We do not need much lift, we must cut down drag. Most of the drag is going to come from the wing, so let us set that near its minimum drag angle, probably about -1 or 0 degrees. It will still be giving some lift at this angle if it has much camber. The tail probably has 2 to 3 degrees less incidence than the wing, which means that on the climb it may be at about -3 degrees, and with less camber than the wing, will probably be giving negative lift. Now, let us see where we are. We are good on the drag, but have a nose-up pitching moment due to the down load on the tail and upload on the wing. (See Fig. 1.) We can still move the thrust line around to balance, and now we are like this: (see Fig. 2).



The position of the wing relative to the tail will be determined by the best gliding performance, when the wing is up at 10° or 12° degrees, of course. Now we seem to have the forces and moments balanced in the longitudinal plane.

The other major action on the model is the torque from the motor. Sidewash from the prop on the wing and front fuselage will compensate this slightly, but we need a force on the front of the model to give a yawing moment to stop the roll tendencies from the torque developing into a spin. This yawing force can be provided by sidewash from the prop on the front fuselage, not to provide a rolling moment, but to yaw the model. This means side area above the prop, and so here is a picture of our complete model.

This looks a bit of a mess, but I think the idea is there. Now let us compare with the standard pylon model. Torque/Rolling characteristics are satisfactorily as before with the side area above the prop center line; the tailplane is almost invariably at positive incidence, so the moment set-up looks like this:

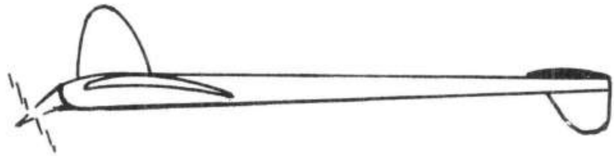


Thrust/Drag gives a nose-up moment and tail lift gives a nose-down moment so everything is fine. In fact, pylon models have been doing pretty well for a long time! However, if the pylon model has positive tail incidence the wing incidence is greater, and so the drag is a little more, I think, than the shape I described.

Looking at the picture I drew earlier, it looks as if the conventional pylon model has less body drag than mine, but maybe I can draw one that looks a bit better.

The next point is that the pylon model has a high wing and mine has a low wing, so the pylon gains on the pendulum effect helping its rolling stability.

Oscar Czepa's models come to mind now. They look like this:



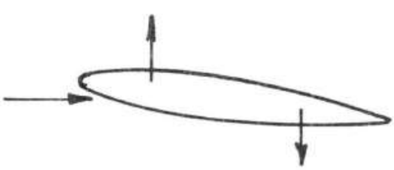
It is similar layout to mine, but he gets his nose down moment from downthrust. This is an improvement as regards getting the weight down, but detracts, I think, because of the more inefficient thrust. As I mentioned in my trajectory stability article, he can probably climb at a steeper angle, in a straight line, but still, I think, he sacrifices in possible height obtained.

Summarizing: I think all really successful contest machines must have side area above the thrust line near the nose. And secondly: the lower thrust line on the fuselage, the more tail incidence is needed. Most of this material I have written is fairly well known, or at least individual planes have been made on the lines of those I have suggested, but at least this letter tells you what I am thinking on the subject.

Center of Lateral Area

Now let me get on to one of my pet hates, (maybe the word is too strong); but I am thinking about certain C.L.A. theories, or, specifically the magic phrase "Center of Lateral Area."

The important point is that the side force on a body does not act anywhere near its center of side area. In fact, and this surprises many people, the lift distribution on a body which has a reasonably smooth shape looks like this. Yes, it actually develops negative lift at the rear end, so the resultant lift looks like this:



Sometimes the lift can be acting ahead of the nose! This depends upon how well the flow remains attached at the rear end. The better it sticks, the more negative lift we get at the rear end, and so the more unstable is the body. This may explain why people find their models less stable when streamlined than when unstreamlined. Of course, this effects both lateral and longitudinal stability.

Proof of this lies in the behavior of the child's balloon on a stick. Let me draw a picture of it. Now if the wind is blowing perpendicular to the balloon, the center of pressure is on the middle of it like in Fig. 12. Just like a wing has its center of drag in the middle. So the center of pressure on the balloon changes from being ahead of the balloon at 0 degrees incident to being at 50% back at 90 degrees incidence. In other words, center of pressure moves back as the incidence increases like this: (Fig. 13)

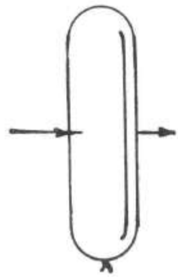


FIG. 12

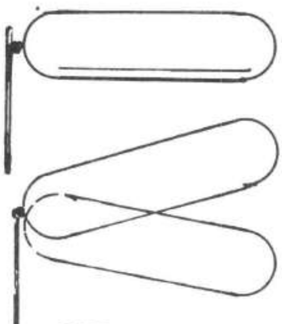


FIG. 14

FIG. 15

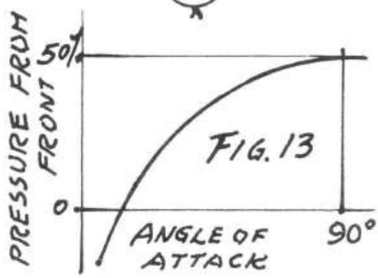


FIG. 13

Now let us go back to the little boy with his balloon. If the wind is blowing against it, what does it tend to do? Well it is unstable at 0 degrees incidence, so it will not just stream into the wind at zero incidence, but it will tend to flap over to one side. When it reaches about 20 or 30 degrees incidence, it becomes stable. But will generally overshoot, and so tends to oscillate about this angle, and may tend to hop over to the other side as in Fig. 14. Sometimes the balloon will tend to sweep out a cone of about 20 degrees like in Fig. 15. I am sure this seems fairly familiar from the fairgrounds.

Well, what has happened to the Center of Pressure? It seems that it might be anywhere, and certainly not at the Center of Lateral area, except when we are at 90 degrees incidence.

POWER MODEL NOTES by Ray Monks England

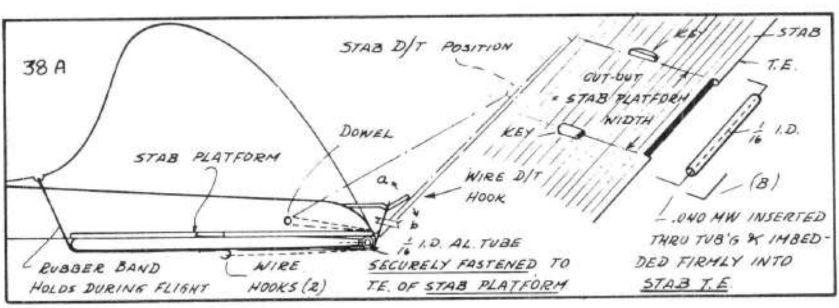
When I received your last year book I was very interested in Stuart Savage's letter in which he complained about his gas models being inconsistant. At that time I too was having much the same experience. The models were fine in calm weather, but in a little turbulence would mush rather than glide. These models featured 45% stab, identical wing and stab construction, and sections with C.G. at the Wing's T.E.

At the last elims "in July" I decided to approach the problem from a different angle. I had come to the conclusion that what was wrong was the stab was too heavily loaded and the longitudinal angle was too small and the C.G. too far aft. So I built two new models. One was short moment, and with a low pylon. The other had a longer moment and higher pylon. Both had same flying surfaces, 10% thick flat bottom wing and 8% stab, 430 sq. in. wing with 160 sq. in. stab. See plans for other details.

Both of the models have proved very reliable during the last few contests last year, and seem to have cleared up the mushing bother.

LOW STAB D/T by N. Ingersoll San Antonio, Texas

This is the system used on the ½A with sheet stab in the 1956 Year Book. With this method, stab cannot be removed from the fuselage, but loose fit between wire and tubing allows shimming under stab for incidence changes. Dotted rubber band is tension band, and correct tension will have to be found thru trial and error. The solid band holds stab in place until fuse burns thru it, causing it to release and allow stab to rotate into D/T position. D/T hook serves as limit and D/T angle can be changed on the field by bending end toward "a" or "b". If removable stab is desired, do not run wire thru tubing, but imbed two pieces of wire "B" into stab and allowing them to extend barely into tubing. Repeated success depends on firm attachment of tubing to stab plaform and maintaining correct tension with dotted band.



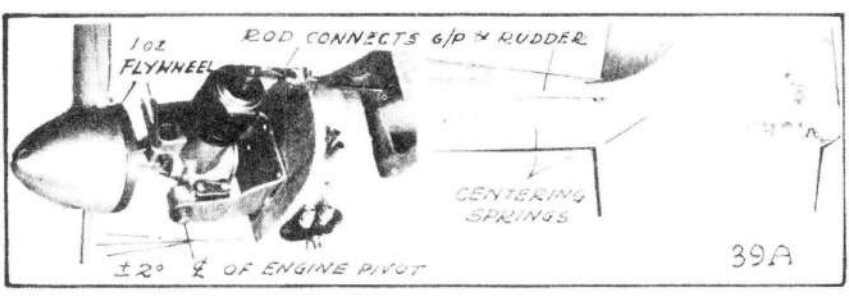
GYRO CONTROL FOR MODELS

by J. Lourie McLarty —————————— Rocky Hill, N. J.

Elimination of spiral dives, and the precise control of turns, dives, and climbs on all types of models sounds too good to be true. Actually this type of performance is quite easy to obtain using a gyro type of control on the elevator and rudder.

During the past three years a series of models were used to check various gyro arrangements and flight performances. A glider was used first with a rudder controlled by a compressed air driven gyro. This gyro was spun by 100 lbs. per sq. in. air pressure on the ground which was sufficient for several minutes of control. Next an Ohlsson 23 was successfully used with an exhaust driven gyro. The Ohlsson's exhaust stack was reduced to 1/8 diameter to obtain sufficient exhaust velocity to spin the bucket type gyro. The tests that followed were made with a Veco Sioux 36 span free-flight. The O. K. Cub series of engines were used—.039, .049, .074 and .099 to check the effects of increasing amounts of power. The engine flywheel gyro system as pictured was used. The model was spiral free under all power used, and it was possible to obtain precise flight patterns—perfectly straight or small and large circles regardless of gusts or high winds, by adjusting the rudder setting alone.

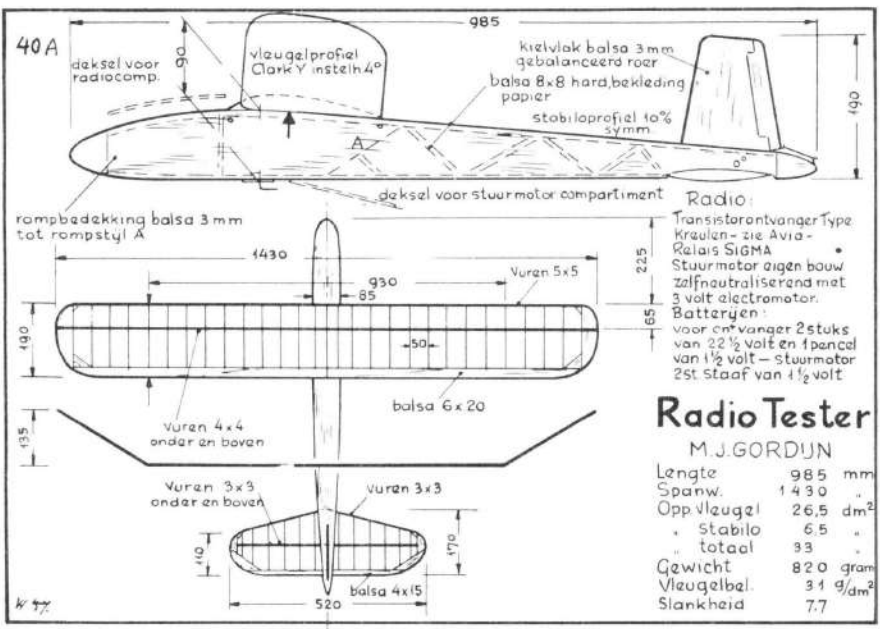
The system shown uses an ounce flywheel mounted behind the prop and an engine mounting which allows the engine to rotate it's c.g. to give about a 2 degree up and down thrust. This up and down motion is transferred to the rudder by means of a glow plug connection and a long rod to the control arm giving left and right rudder movement. A spring system is used to dampen the forces involved and to allow various rudder settings to suit the flight path desired. What happens is that when the engine is running, the flywheel becomes a gyroscope and therefore any side motion of the fuselage causes the engine gyro to produce a force at right angles to the force trying to move it; therefore any side motion of the fuselage is immediately corrected by rudder action.

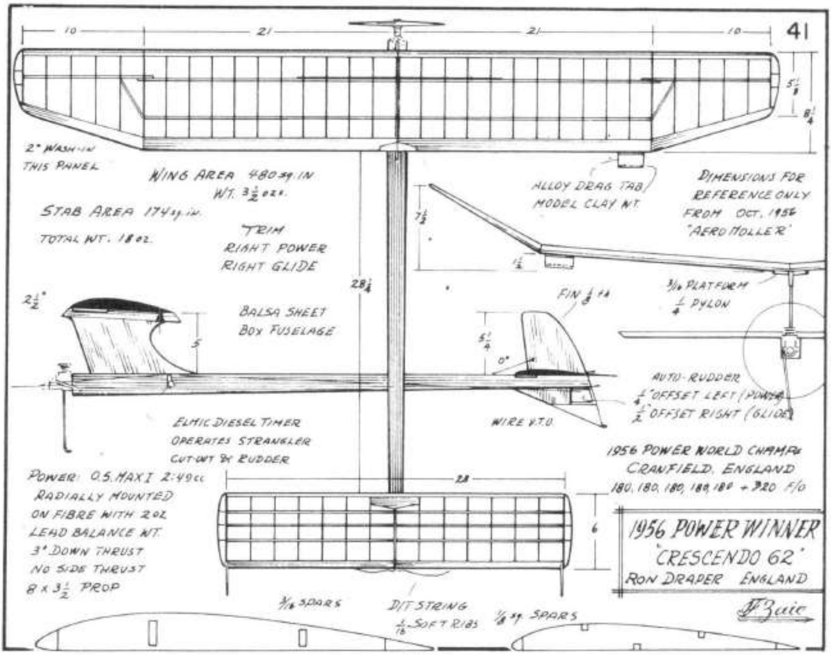


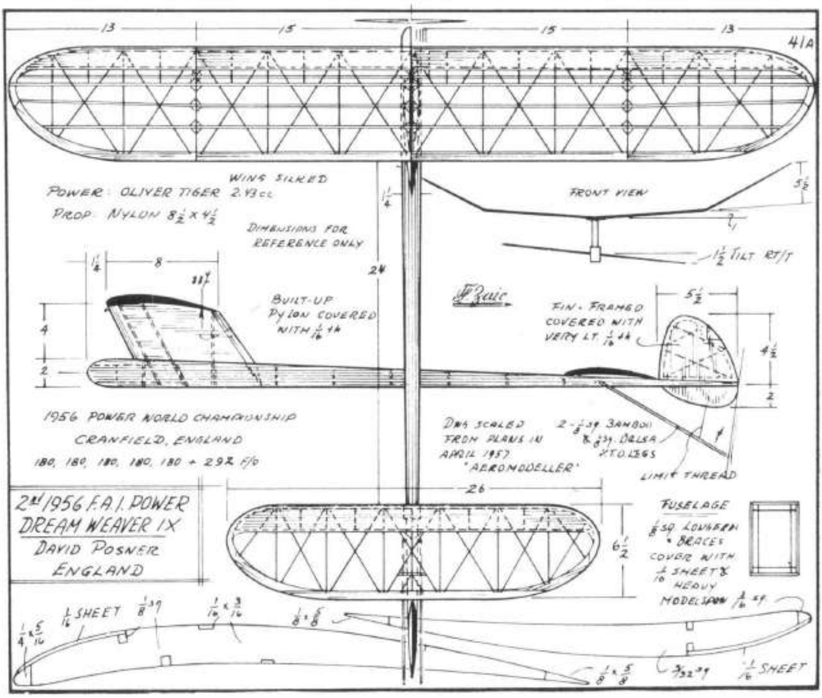
In radio models the engine up and down motion of the gyro could open and close contacts to give precise turns or straight flight. The spring which determines the rudder setting could be moved by a regular escapement or other type of control for turns. If the plane is large enough an .049 engine powered gyro could be used as a separate unit in the fuselage. Two such systems would add controlled climbs and dives by controlling the elevator.

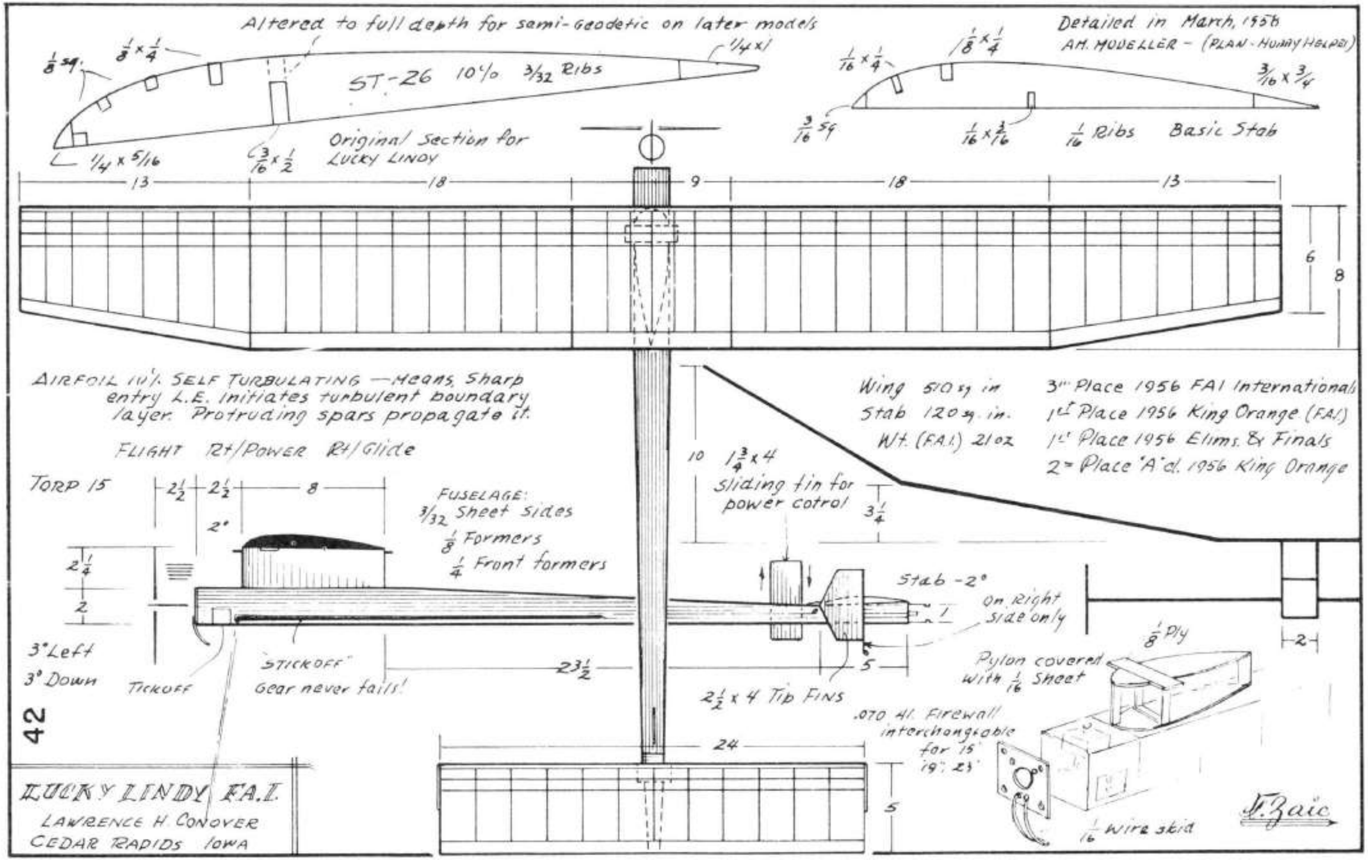
Free flight models can have freedom from excessive turns and spiral dives and also precise predictable turns. Possibly the climb path as determined by the stabilizer setting could be used as the control instead of the rudder and also eliminate spiral diving, in either case the model can probably have less dihedral and smaller horizontal tail surfaces and thereby be more efficient since the gyro is taking care of some of the stability. Contest models having short engine runs could make use of a ball bearing mounted gyro which would be spun using a ground supply of compressed air before launching and would run for several minutes. This would give control during the whole flight.

In U-control, it might be interesting to determine by flight tests the effect of coupling a gyro to the elevaor and using the control lines to move the gyro neutral setting. The manoeuvers should be very smooth and professional in appearance.

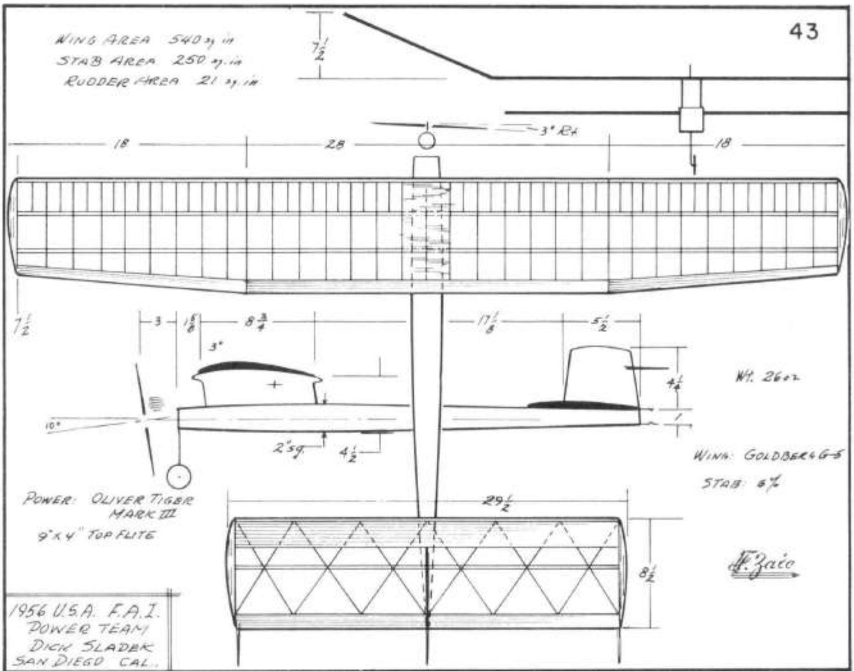


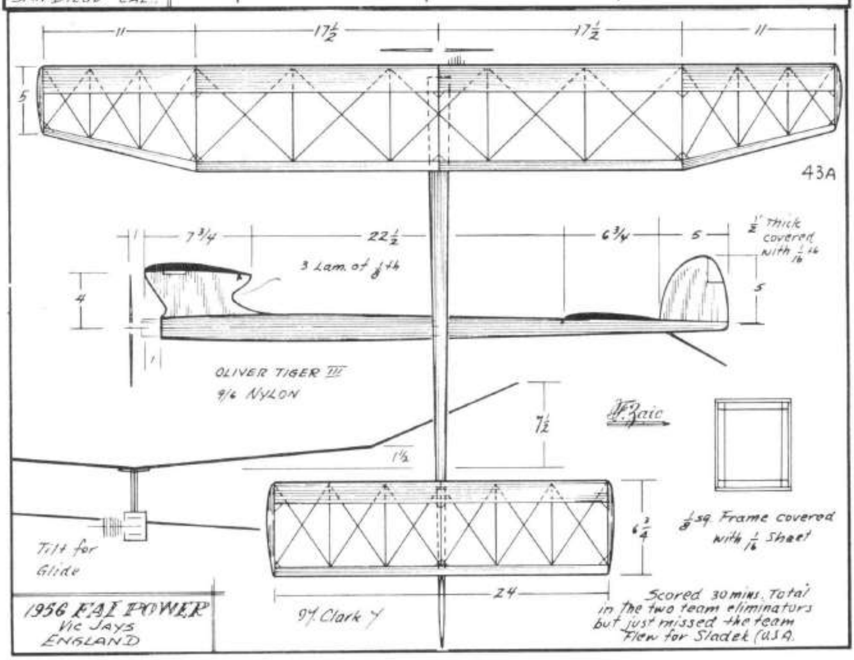

41
2" WASH-IN THIS PANEL
WING AREA 480 sq. IN
WT. 3½ ozs.
STAB AREA 174 sq. in.
TOTAL WT. 18 oz.
TRIM
RIGHT POWER
RIGHT GLIDE
BALSA SHEET
BOX FUSELAGE
ALLOY DRAG TAB
MODEL CLAY WT.
DIMENSIONS FOR REFERENCE ONLY FROM OCT. 1956 "AEROMODELLER"
3/16 PLATFORM
¼ PYLON
FIN ⅛ th
AUTO-RUDDER
¼" OFFSET LEFT (POWER)
½" OFFSET RIGHT (GLIDE)
WIRE V.T.O.
ELMIC DIESEL TIMER OPERATES STRANGLER CUT-OUT & RUDDER
POWER: O.S. MAX I 2.49cc
RADIALLY MOUNTED ON FIBRE WITH 2 OZ LEAD BALANCE WT.
3° DOWN THRUST
NO SIDE THRUST
8 x 3½ PROP
1956 POWER WORLD CHAMPS
CRANFIELD, ENGLAND
180, 180, 180, 180, 180 + 320 F/O
1956 POWER WINNER
"CRESCENDO 62"
RON DRAPER ENGLAND
3/16 SPARS
D/T STRING
1/16 SOFT RIBS
⅛ sq. SPARS

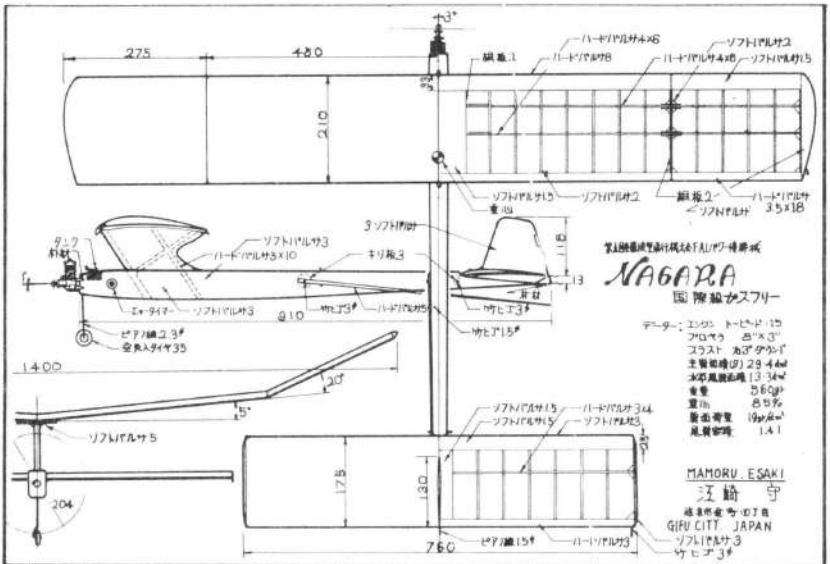

41A
WING SILKED
POWER: OLIVER TIGER 2.49cc
PROP: NYLON 8½ x 4½
DIMENSIONS FOR REFERENCE ONLY
FRONT VIEW
1½ TILT RT/T
BUILT-UP PYLON COVERED WITH 1/16 th
FIN - FRAMED COVERED WITH VERY LT. 1/16 th
1956 POWER WORLD CHAMPIONSHIP
CRANFIELD, ENGLAND
180, 180, 180, 180, 180 + 292 F/O
DWG SCALED FROM PLANS IN APRIL 1957 "AEROMODELLER"
2 - ⅛ sq. BAMBOO & ⅛ sq. BALSA V.T.O. LEGS
LIMIT THREAD
2nd 1956 F.A.I. POWER
DREAM WEAVER IX
DAVID POSNER
ENGLAND
FUSELAGE
⅛ SQ. LONGERON & BRACES
COVER WITH 1/16 SHEET & HEAVY MODELSPAN
1/16 SHEET
⅛ sq
1/16 x 3/16
⅛ x ⅝
¼ x 5/16
3/32 sq
1/16 SHEET

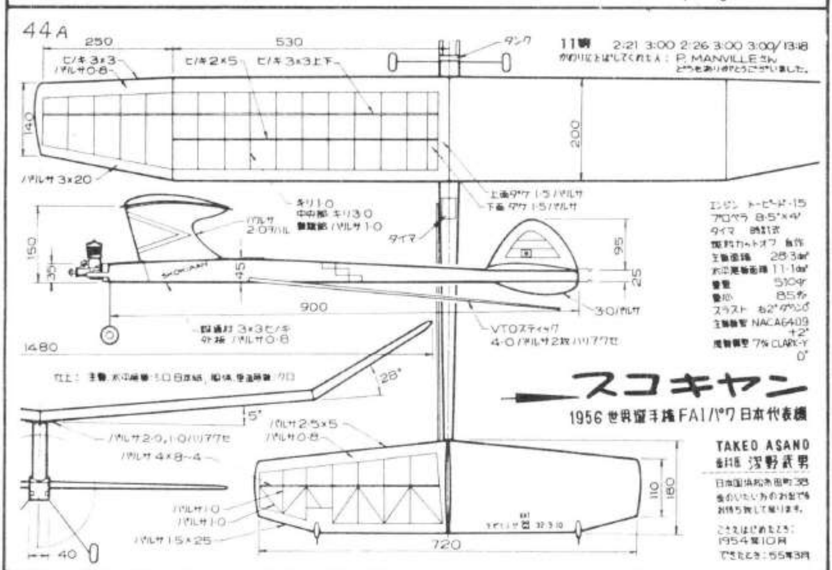


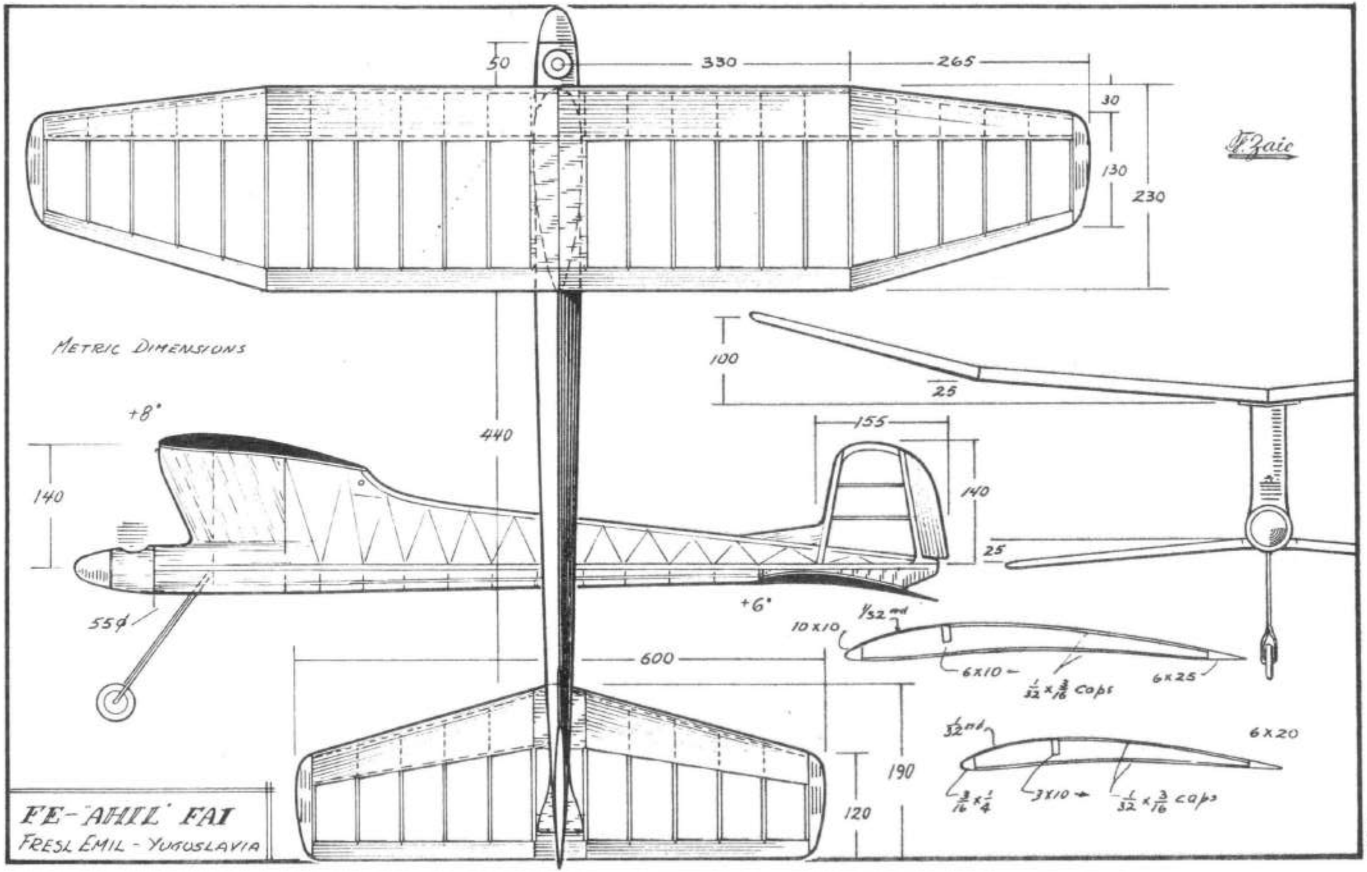
Altered to full depth for semi-geodetic on later models
1/8 sq.
1/8 x 1/4
1/4 x 1
ST-26 10% 3/32 Ribs
1/4 x 5/16
3/16 x 1/2
Original Section for LUCKY LINDY
Detailed in March, 1956
AM. MODELLER - (PLAN - HOBBY HELPER)
1/16 x 1/4
1/8 x 1/4
3/16 x 3/4
3/16 sq
1/16 x 3/16
1/16 Ribs
Basic Stab
13
18
9
18
13
6
8
AIRFOIL 10% SELF TURBULATING —Means Sharp entry L.E. initiates turbulent boundary layer. Protruding spars propagate it.
FLIGHT Rt/Power Rt/Glide
Wing 510 sq. in.
Stab 120 sq. in.
Wt. (F.A.I.) 21 oz
3rd Place 1956 FAI Internationals
1st Place 1956 King Orange (F.A.I.)
1st Place 1956 Elims. & Finals
2nd Place "A" cl. 1956 King Orange
10
1 3/4 x 4 sliding fin for power cotrol
3 1/4
TORP 15
2 1/2
2 1/2
8
2°
2 1/4
2
FUSELAGE:
3/32 Sheet sides
1/8 Formers
1/4 Front formers
Stab -2°
On Right side only
1
3° Left
3° Down
TICKOFF
"STICKOFF" Gear never fails!
23 1/2
5
2 1/2 x 4 Tip FINS
2
1/8 Ply
Pylon covered with 1/16 Sheet
.070 Al. Firewall interchangeable for 15, 19, 29
24
5
1/16 wire skid
LUCKY LINDY F.A.I.
LAWRENCE H. CONOVER
CEDAR RAPIDS IOWA
V. Zaic

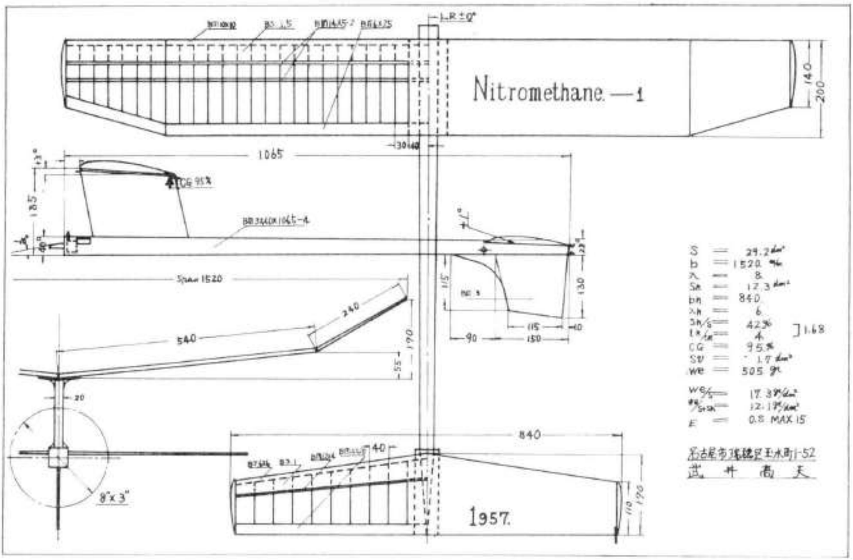

43
WING AREA 540 sq in
STAB AREA 250 sq. in
RUDDER AREA 21 sq. in
3° Rt
18
28
18
3°
10°
2"sq.
Wt. 26 oz
WING: GOLDBERG G-5
STAB: 6%
POWER: OLIVER TIGER MARK III
9"x4" TOP FLITE
1956 U.S.A. F.A.I.
POWER TEAM
DICK SLADEK
SAN DIEGO CAL.

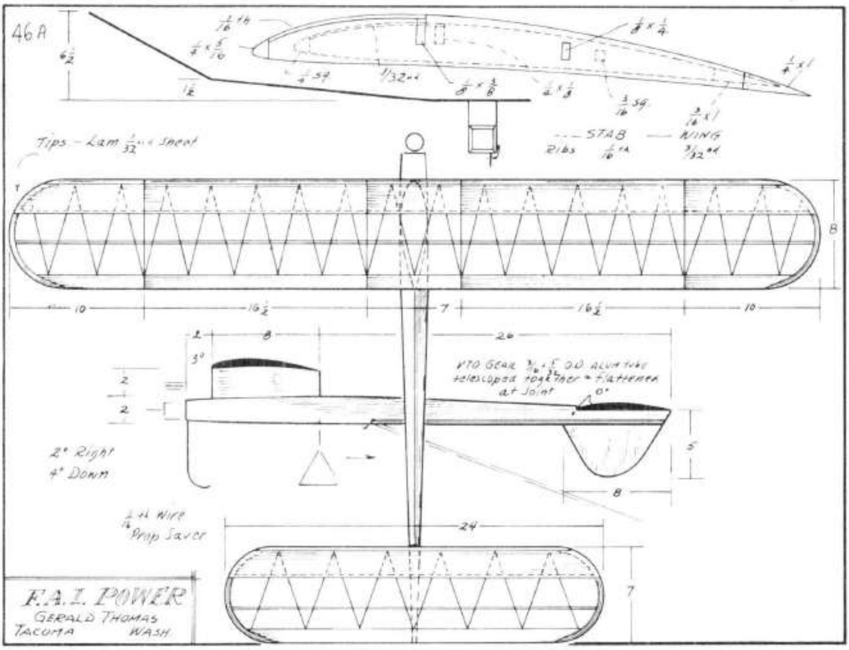

43A
11
11
3 Lam. of 1/8 th
1/2" thick covered with 1/16 th
OLIVER TIGER III
9/6 NYLON
Tilt for Glide
1/8 sq. Frame covered with 1/16 Sheet
24
9% Clark Y
Scored 30 mins. Total in the two team eliminators but just missed the team Flew for Sladek (USA.
1956 FAI POWER
Vic JAYS
ENGLAND


+3°
275
480
210
33
ハードバルサ4×6
ハードバルサ8
ソフトバルサ2
ハードバルサ4×8
ソフトバルサ1.5
ソフトバルサ1.5
ソフトバルサ2
重心
ハードバルサ
3.5×18
ソフトバルサ
ソフトバルサ3
ハードバルサ3×10
キリ板3
118
13
タンク
ピアノ線2.3ϕ
1400
20°
5°
ソフトバルサ5
204
ソフトバルサ1.5
ハードバルサ3×4
ソフトバルサ1.5
ソフトバルサ3
175
130
760
ピアノ線1.5ϕ
ハードバルサ3
ソフトバルサ3
竹ヒゴ3ϕ
NAGARA
国際級ガスフリー
データー：エンジン　トーピード・15
プロペラ　8"×3"
スラスト　右2°ダウン1°
主翼面積(p) 29.44dm²
水平尾翼面積 13.34dm²
重量 560gr
重心 85%
翼面荷重 19gr/dm²
尾翼容積 1.41
MAMORU. ESAKI
江崎　守
GIFU CITY　JAPAN

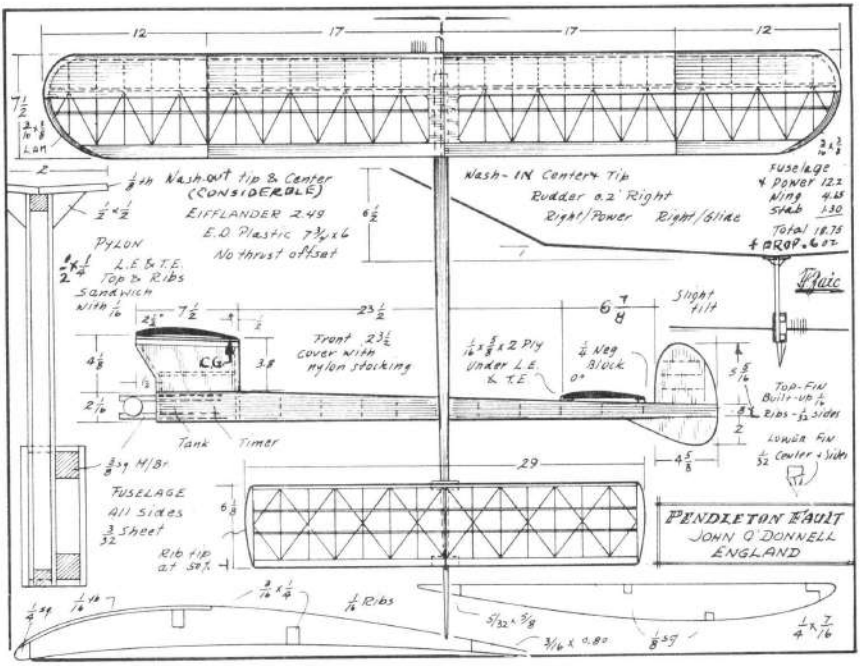

44A
250
530
ヒノキ3×3
バルサ0.8
ヒノキ2×5
ヒノキ3×3上下
タンク
11啊　2:21 3:00 2:26 3:00 3:00/13:18
かわりにとばしてくれた人：P. MANVILLEさん
どうもありがとうございました。
140
200
バルサ3×20
上面ダケ1.5バルサ
下面ダケ1.5バルサ
キリ1.0
中央部 キリ3.0
バルサ1.0
タイマ
150
35
45
95
25
900
3.0バルサ
VTOスティック
4.0バルサ2枚ハリアワセ
1480
28°
5°
バルサ2.5×5
バルサ0.8
バルサ4×8～4
110
180
720
40
バルサ1.5×25
エンジン　トーピード・15
プロペラ　8.5"×4"
タイマ　時計式
燃料カットオフ　自作
主翼面積　28.3dm²
水平尾翼面積 11.1dm²
重量　510gr
重心　85%
スラスト　右2°ダウン0°
主翼翼型 NACA6409 +2°
尾翼翼型 7% CLARK-Y 0°
スコキヤン
1956世界選手権FAIパワ日本代表機
TAKEO ASANO
設計 浅野武男
こさえはじめたとき：1954年10月
できたとき：55年3月

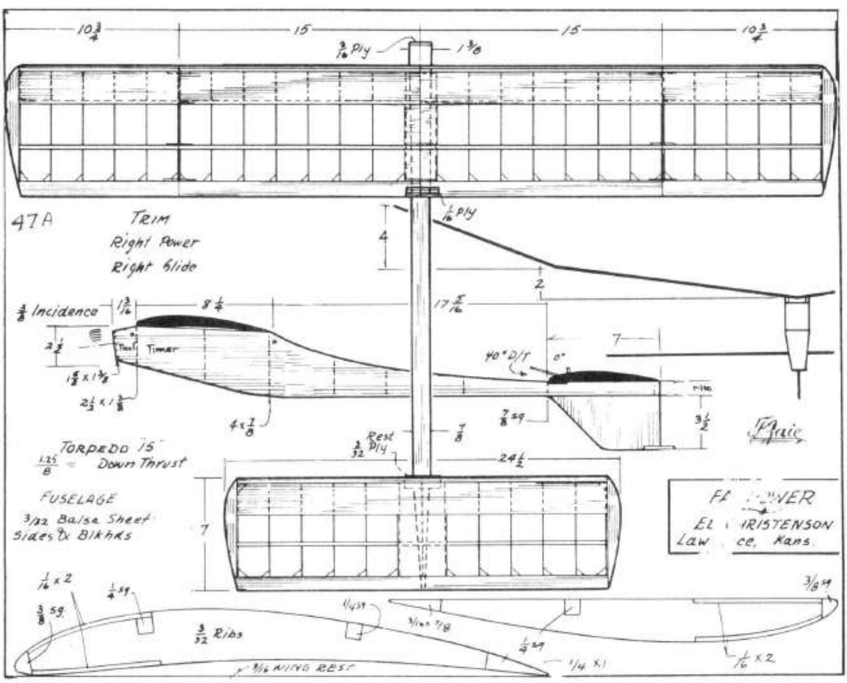

FE-'AHIL' FAI
FRESL EMIL - YUGUSLAVIA
METRIC DIMENSIONS
F. Zaic
50
330
265
30
130
230
100
25
25
155
140
440
140
+8°
+6°
55ϕ
600
190
120
10 X 10
1/32 md
6 X 10
1/32 x 3/16 caps
6 X 25
1/32 md
6 X 20
3/16 x 1/4
3 X 10
1/32 x 3/16 caps

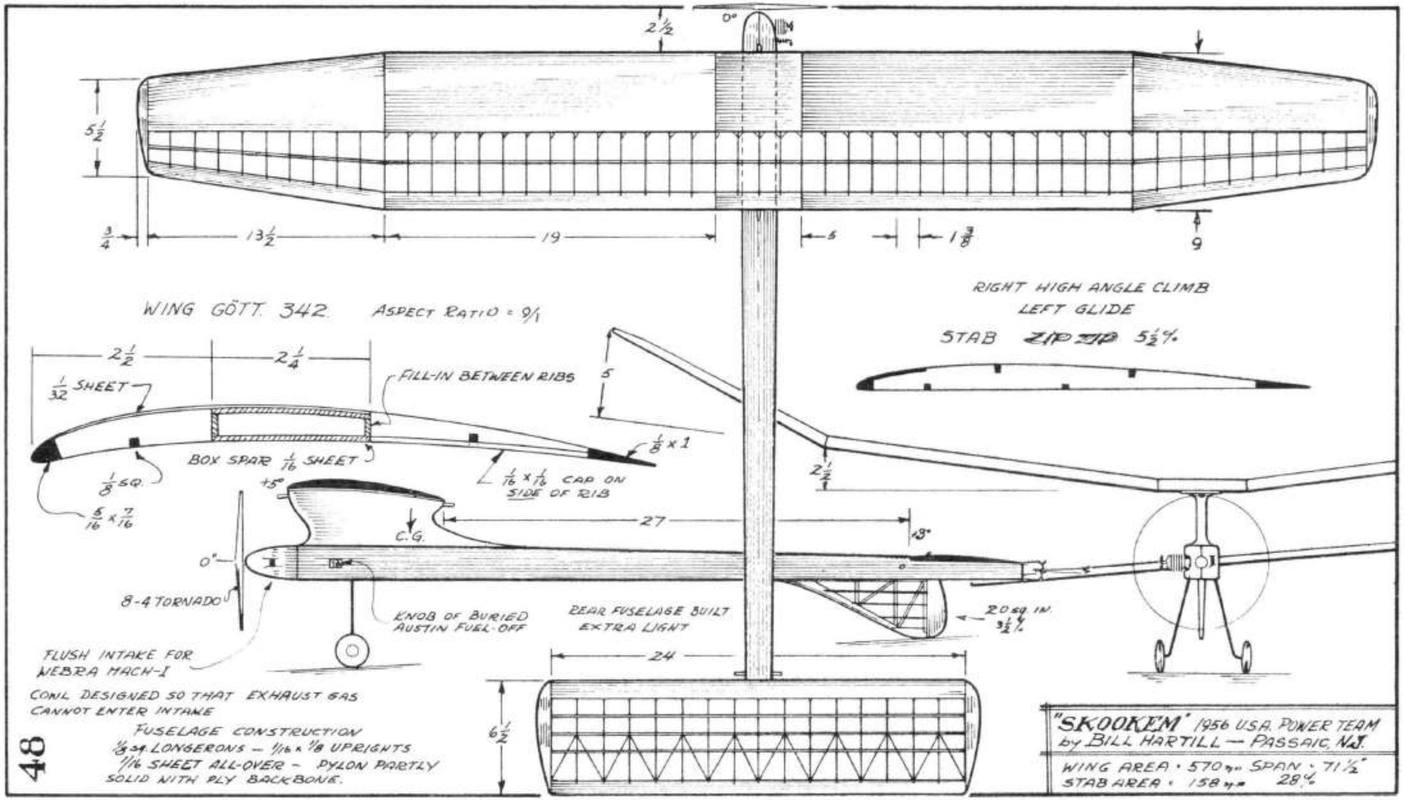




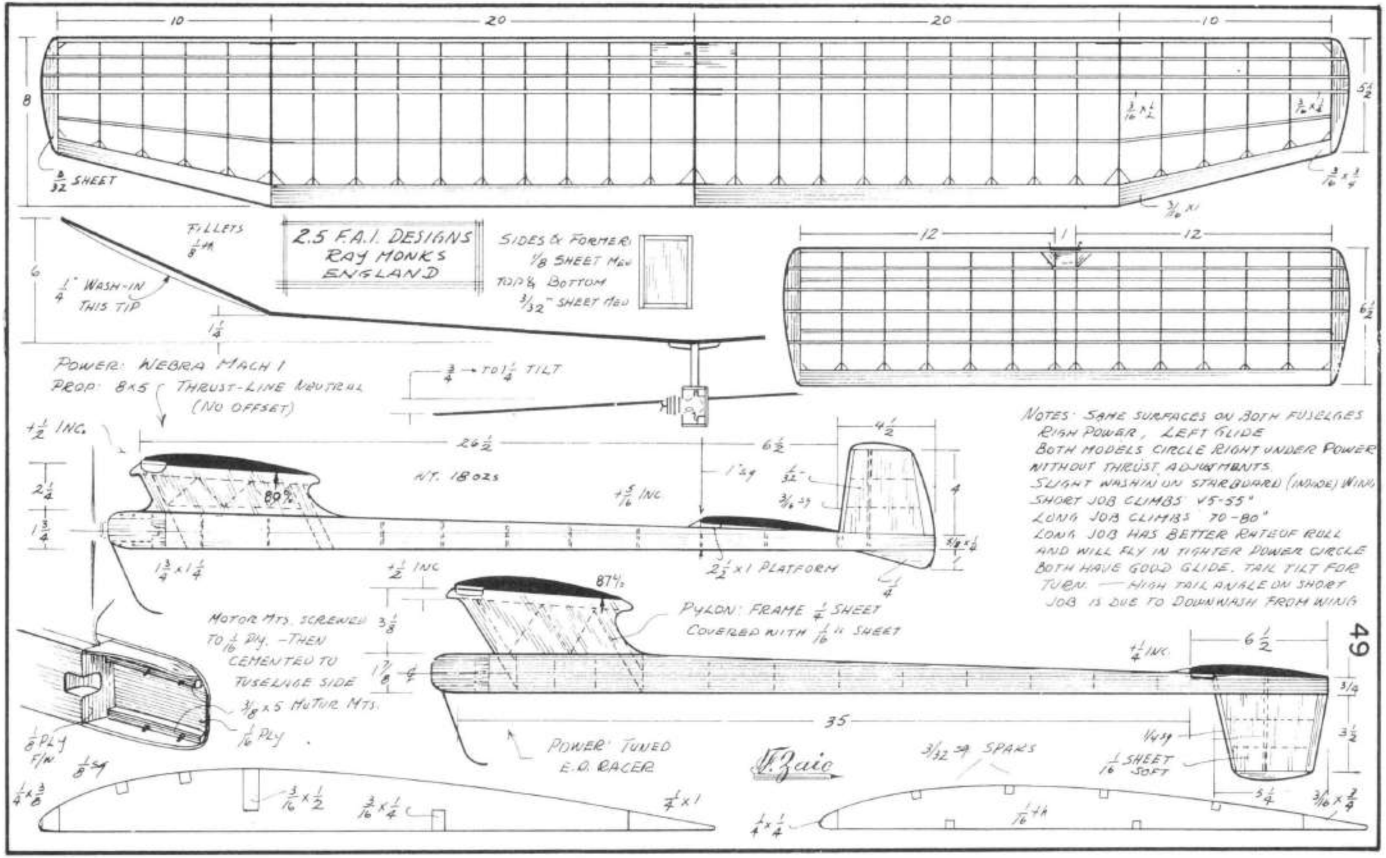
Most fellows have trouble with VTOs. I found that very consistant take-offs can be had by pointing the right wing into the wind (with model having right climb adjustments). This minimizes the tendency of the model to flip on its back. The wind tends to lift up the right wing rather than letting it come in the right with its power circle.

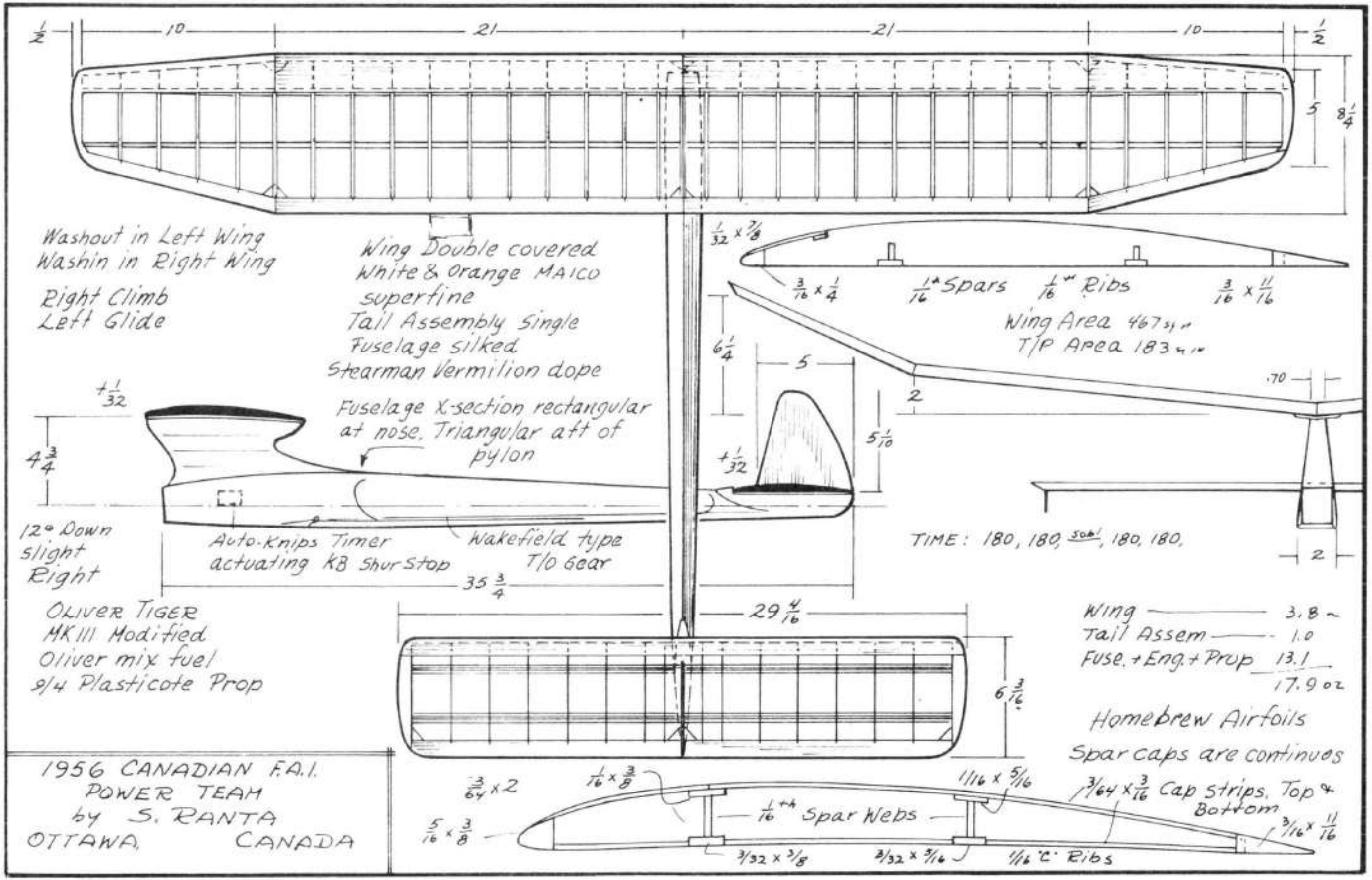

PENDLETON FAULT
JOHN O'DONNELL
ENGLAND
1/8th Wash-out tip & Center (CONSIDERBLE)
EIFFLANDER 2.49
E.D. Plastic 7 3/4 x 6
No thrust offset
Wash-IN Center+ Tip
Rudder 0.2" Right
Right/Power Right/Glide
Fuselage + Power 12.2
Wing 4.65
Stab 1.30
Total 18.75
+ PROP. 6 oz
PYLON
L.E. & T.E. Top & Ribs Sandwich with 1/16
Front 23 1/2 cover with nylon stocking
1/4 Neg Block
Slight tilt
Top-Fin Built-up 1/16 Ribs - 1/32 sides
Lower Fin 1/32 Center + Sides
C.G.
Tank
Timer
FUSELAGE All sides 3/32 Sheet
Rib tip at 50%
1/16 Ribs


47A
TRIM
Right Power
Right Glide
3/8 Incidence
Timer
40° D/T
TORPEDO 15
Down Thrust
FUSELAGE
3/32 Balsa Sheet Sides & Blkhds
3/32 Ribs
3/16 WING REST



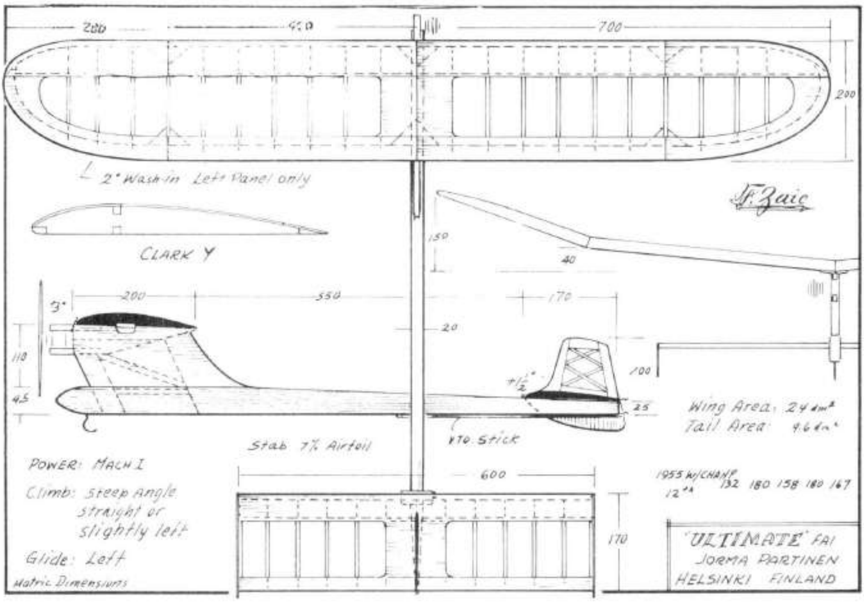
2½
0°
5½
¾
13½
19
5
1⅜
9
RIGHT HIGH ANGLE CLIMB
LEFT GLIDE
STAB ZIP ZIP 5½%
WING GÖTT. 342.
ASPECT RATIO = 9/1
2½
2¼
1/32 SHEET
FILL-IN BETWEEN RIBS
5
⅛ x 1
BOX SPAR 1/16 SHEET
⅛ SQ.
5/16 x 7/16
1/16 x 1/16 CAP ON SIDE OF RIB
2½
+5°
C.G.
27
13°
0°
8-4 TORNADO
KNOB OF BURIED AUSTIN FUEL-OFF
REAR FUSELAGE BUILT EXTRA LIGHT
20 SQ. IN. 3½%
FLUSH INTAKE FOR NEBRA MACH-I
24
CONL DESIGNED SO THAT EXHAUST GAS CANNOT ENTER INTAKE
FUSELAGE CONSTRUCTION
⅛ sq. LONGERONS — 1/16 x ⅛ UPRIGHTS
1/16 SHEET ALL-OVER — PYLON PARTLY SOLID WITH PLY BACKBONE.
6½
"SKOOKEM" 1956 U.S.A. POWER TEAM
by BILL HARTILL — PASSAIC, N.J.
WING AREA · 570 sq. in. SPAN · 71½"
STAB AREA · 158 sq. in. 28%

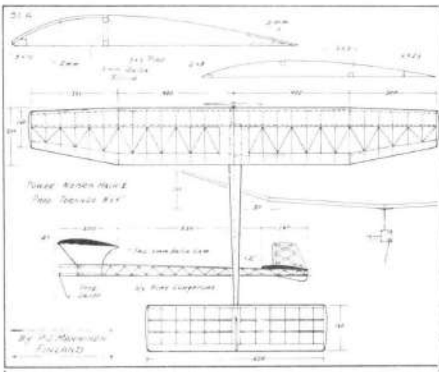

2.5 F.A.I. DESIGNS
RAY MONKS
ENGLAND
10
20
20
10
8
$5\frac{1}{2}$
$\frac{3}{32}$ SHEET
$\frac{3}{16}$ x $\frac{1}{2}$
$\frac{3}{16}$ x $\frac{3}{4}$
$\frac{3}{16}$ x 1
FILLETS $\frac{1}{8}$ rad
6
$\frac{1}{4}$" WASH-IN THIS TIP
$1\frac{1}{4}$
SIDES & FORMER: 1/8 SHEET MED
TOP & BOTTOM 3/32" SHEET MED
12
1
12
$6\frac{1}{2}$
POWER: WEBRA MACH 1
PROP: 8x5
THRUST-LINE NEUTRAL (NO OFFSET)
$\frac{3}{4}$ → TO $1\frac{1}{4}$ TILT
$+\frac{1}{2}$ INC.
$26\frac{1}{2}$
$6\frac{1}{2}$
$4\frac{1}{2}$
$2\frac{1}{4}$
$1\frac{3}{4}$
80%
WT. 18 OZS
$+\frac{5}{16}$ INC
1" sq
$\frac{1}{32}$
3/16 sq
4
$\frac{3}{8}$ x $\frac{1}{4}$
$1\frac{3}{4}$ x $1\frac{1}{4}$
$2\frac{1}{2}$ x 1 PLATFORM
$\frac{1}{4}$
NOTES: SAME SURFACES ON BOTH FUSELAGES
RIGHT POWER, LEFT GLIDE
BOTH MODELS CIRCLE RIGHT UNDER POWER WITHOUT THRUST ADJUSTMENTS.
SLIGHT WASHIN ON STARBOARD (INSIDE) WING
SHORT JOB CLIMBS 45-55°
LONG JOB CLIMBS 70-80°
LONG JOB HAS BETTER RATE OF ROLL AND WILL FLY IN TIGHTER POWER CIRCLE
BOTH HAVE GOOD GLIDE. TAIL TILT FOR TURN. — HIGH TAIL ANGLE ON SHORT JOB IS DUE TO DOWNWASH FROM WING
$+\frac{1}{2}$ INC
$87\frac{1}{2}$
$3\frac{1}{8}$
$1\frac{7}{8}$
MOTOR MTS. SCREWED TO $\frac{1}{16}$ PLY. - THEN CEMENTED TO FUSELAGE SIDE
3/8 x 5 MOTOR MTS.
$\frac{1}{16}$ PLY
$\frac{1}{8}$ PLY F/W
$\frac{1}{8}$ sq
PYLON: FRAME $\frac{1}{4}$ SHEET COVERED WITH $\frac{1}{16}$" SHEET
$+\frac{1}{4}$ INC
$6\frac{1}{2}$
3/4
$3\frac{1}{2}$
35
1/4 sq
$\frac{1}{16}$ SHEET SOFT
POWER: TUNED E.D. RACER
3/32 sq SPARS
$5\frac{1}{4}$
$\frac{1}{4}$ x $\frac{3}{8}$
$\frac{3}{16}$ x $\frac{1}{2}$
$\frac{3}{16}$ x $\frac{1}{4}$
$\frac{1}{4}$ x 1
$\frac{1}{4}$ x $\frac{1}{4}$
$\frac{1}{16}$ rib
3/16 x $\frac{3}{4}$

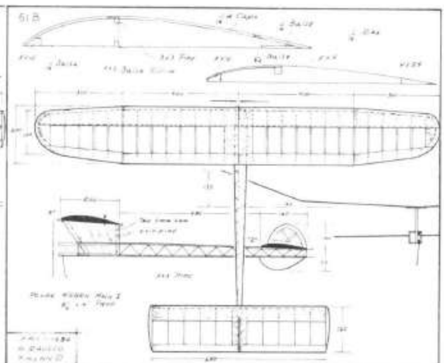


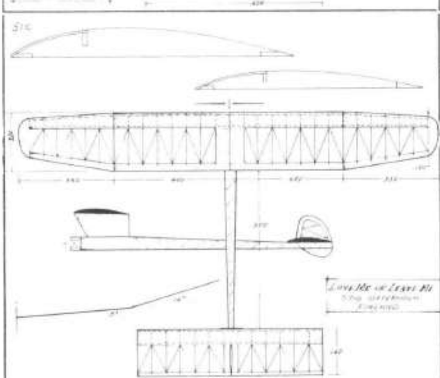
Washout in Left Wing
Washin in Right Wing
Right Climb
Left Glide
Wing Double covered
White & Orange MAICO superfine
Tail Assembly Single
Fuselage silked
Stearman Vermilion dope
Fuselage X-section rectangular at nose. Triangular aft of pylon
12° Down slight Right
Auto-Knips Timer actuating KB Shur Stop
Wakefield type T/O Gear
OLIVER TIGER
MK III Modified
Oliver mix fuel
9/4 Plasticote Prop
1/16" Spars
1/16" Ribs
Wing Area 467 sq in
T/P Area 183 sq in
TIME: 180, 180, 50 sec, 180, 180.
Wing — 3.8 oz
Tail Assem — 1.0
Fuse. + Eng. + Prop 13.1
17.9 oz
Homebrew Airfoils
Spar caps are continuos
3/64 x 3/16 Cap Strips, Top & Bottom
1/16" Spar Webs
1/16 "C" Ribs
3/32 x 3/8
3/32 x 5/16
1/16 x 3/8
1/16 x 5/16
3/64 x 2
5/16 x 3/8
3/16 x 11/16
3/16 x 1/4
1/32 x 3/8
1956 CANADIAN F.A.I.
POWER TEAM
by S. RANTA
OTTAWA, CANADA

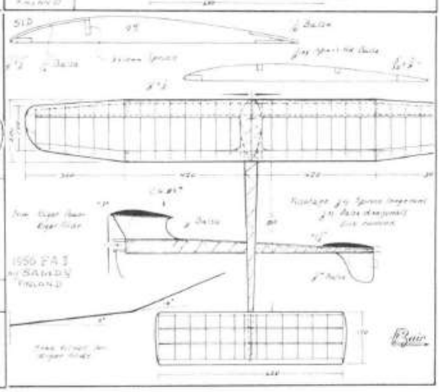
51

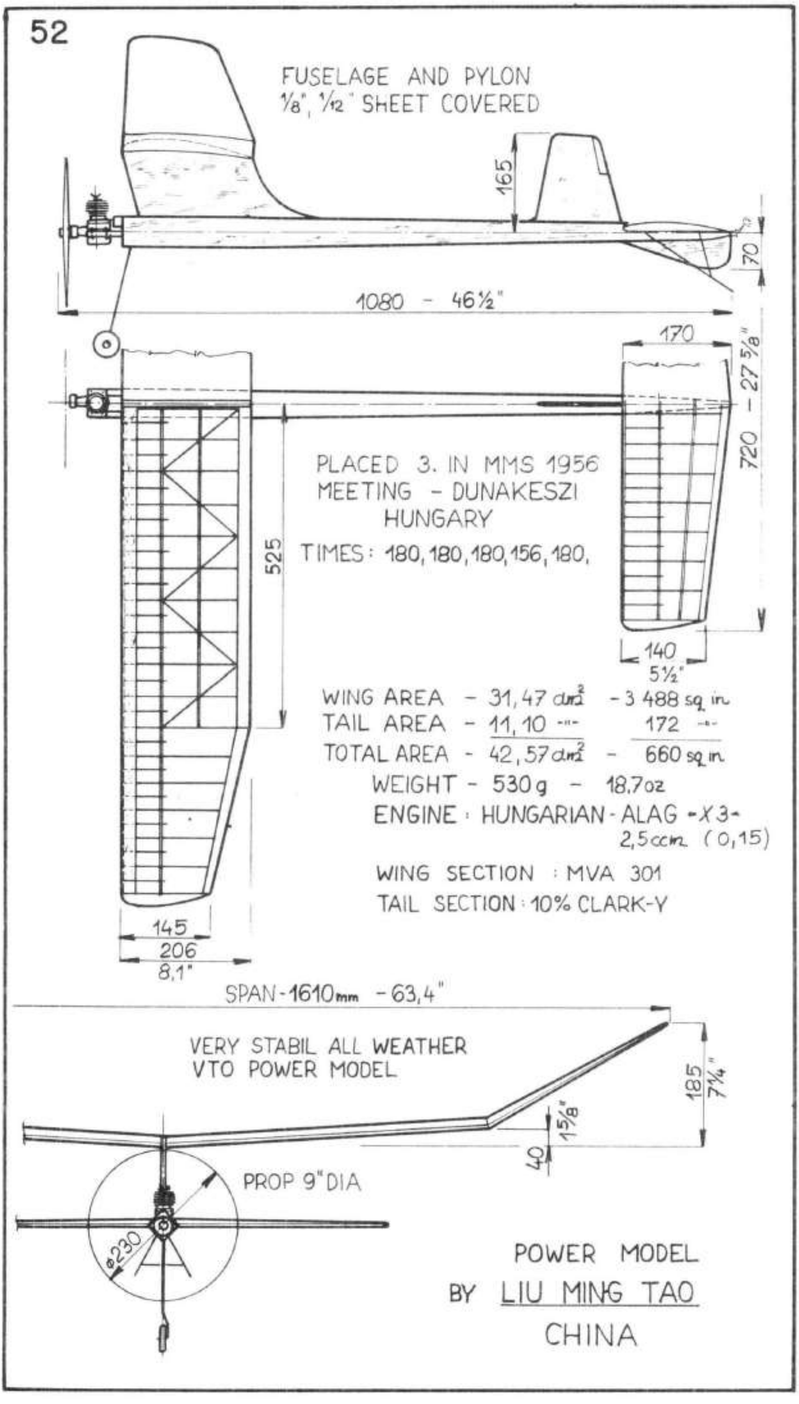

280
450
700
200
2° Wash-in Left Panel only
CLARK Y
150
40
200
550
170
3°
20
110
45
100
+1/2°
25
Wing Area: 24 dm²
Tail Area: 4.6 dm²
Stab 7% Airfoil
RTO Stick
POWER: MACH I
Climb: steep Angle
straight or
slightly left
Glide: Left
Metric Dimensions
600
1955 W/CHAMP. 132 180 158 180 167
12th
170
"ULTIMATE" FAI
JORMA PARTINEN
HELSINKI FINLAND
F. Zaic

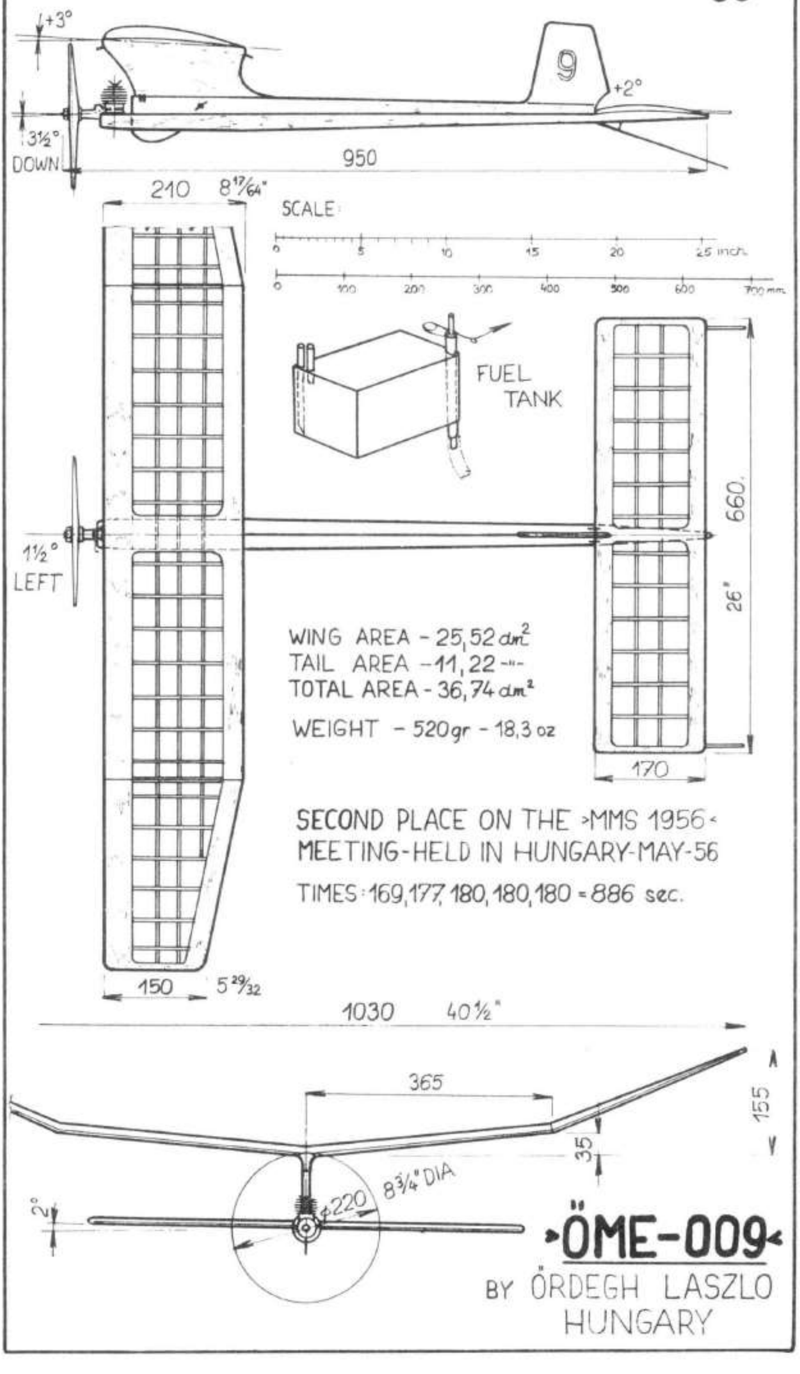

51 A
FINLAND

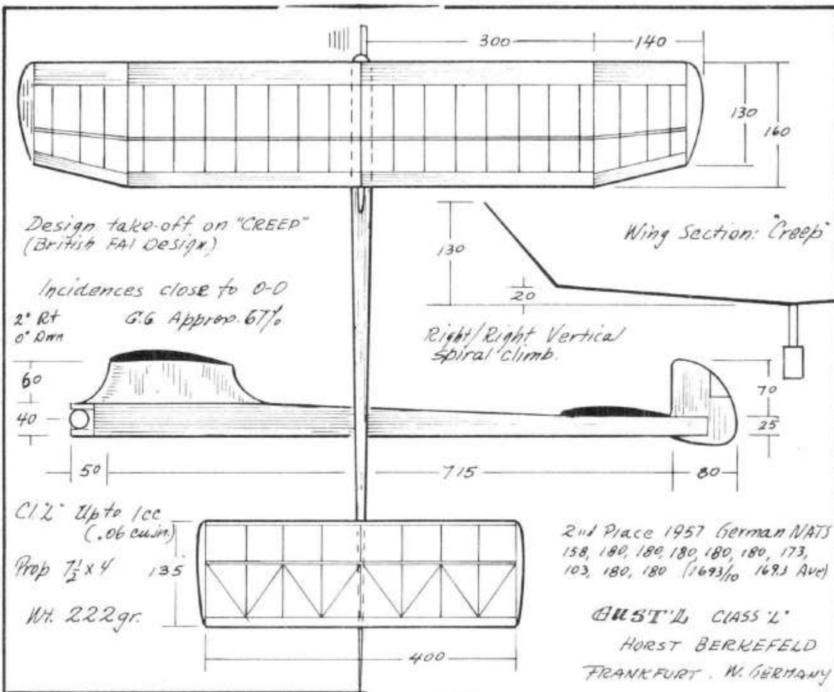

51 B

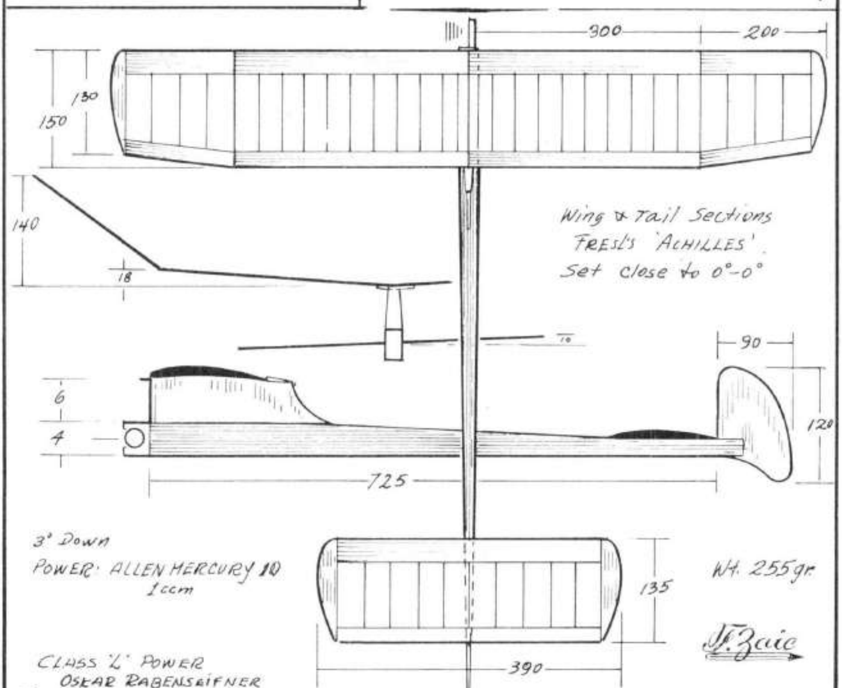

51 C

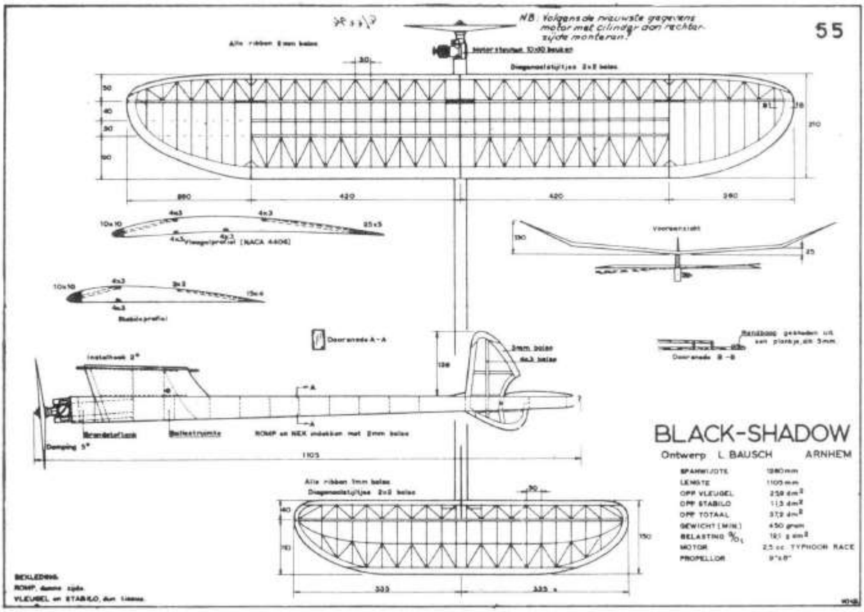

51 D
1956 F.A.I.
FINLAND
F. Zaic

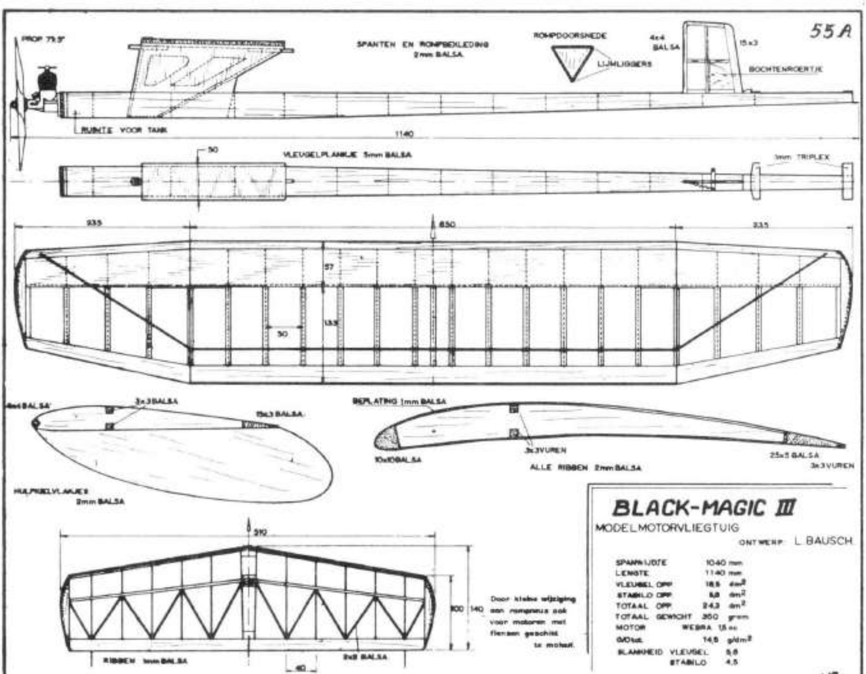

52
FUSELAGE AND PYLON
1/8", 1/12" SHEET COVERED
165
70
1080 - 46½"
170
720 - 27 5/8"
PLACED 3. IN MMS 1956
MEETING - DUNAKESZI
HUNGARY
525
TIMES: 180, 180, 180, 156, 180,
140
5½"
WING AREA - 31,47 dm² - 3 488 sq in
TAIL AREA - 11,10 -"- 172 -"-
TOTAL AREA - 42,57 dm² - 660 sq in
WEIGHT - 530 g - 18,7 oz
ENGINE: HUNGARIAN - ALAG - X 3 -
2,5 ccm (0,15)
WING SECTION : MVA 301
TAIL SECTION : 10% CLARK-Y
145
206
8,1"
SPAN - 1610 mm - 63,4"
VERY STABIL ALL WEATHER
VTO POWER MODEL
185
7¼"
1 5/8"
40
PROP 9" DIA
⌀230
POWER MODEL
BY LIU MING TAO
CHINA


+3°
9
+2°
3½°
DOWN
950
210 8 17/64"
SCALE
0 5 10 15 20 25 inch
0 100 200 300 400 500 600 700 mm
FUEL
TANK
660
26"
1½°
LEFT
WING AREA - 25,52 dm²
TAIL AREA - 11,22 -"-
TOTAL AREA - 36,74 dm²
WEIGHT - 520gr - 18,3 oz
170
SECOND PLACE ON THE »MMS 1956«
MEETING-HELD IN HUNGARY-MAY-56
TIMES: 169,177, 180, 180, 180 = 886 sec.
150 5 29/32
1030 40½"
365
155
35
ϕ220 8¾" DIA
2°
»ÖME-009«
BY ÖRDEGH LASZLO
HUNGARY

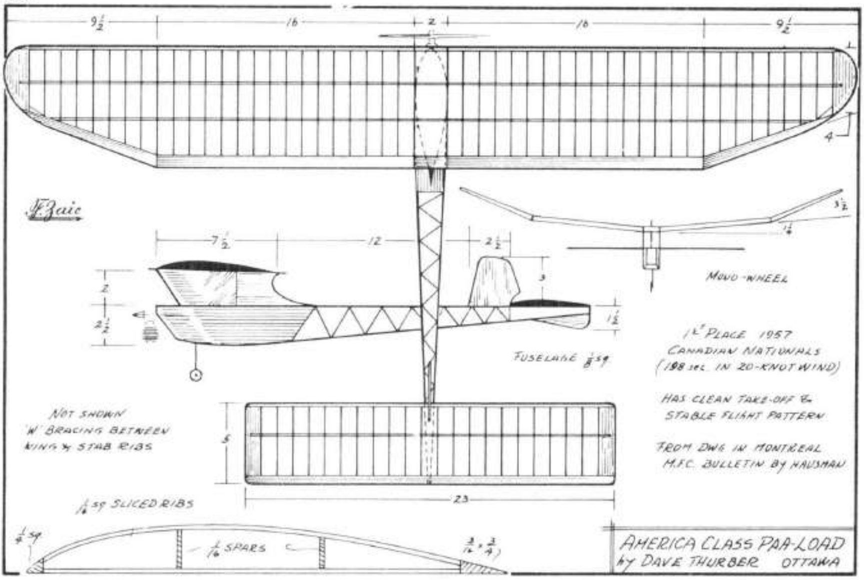

300
140
130
160
Design take-off on "CREEP" (British FAI Design)
Wing Section: "Creep"
Incidences close to 0-0
2° Rt
0° Dwn
G.G. Approx. 67%
130
20
Right/Right Vertical Spiral climb.
60
40
70
25
50
715
80
Cl "L" Up to 1cc (.06 cu.in.)
Prop 7½ x 4
135
Wt. 222 gr.
2nd Place 1957 German NATS
158, 180, 180, 180, 180, 180, 173, 103, 180, 180 (1693/10 169.3 Ave)
GUST'L CLASS "L"
HORST BERKEFELD
FRANKFURT. W. GERMANY
400


300
200
130
150
140
18
Wing & Tail Sections FRESL'S "ACHILLES"
Set close to 0°-0°
90
6
4
120
725
3° Down
POWER: ALLEN MERCURY 10 1ccm
135
Wt. 255 gr.
F. Zaic
CLASS "L" POWER
OSKAR RABENSEIFNER
FRANKFURT, A.M. W. GERMANY
390

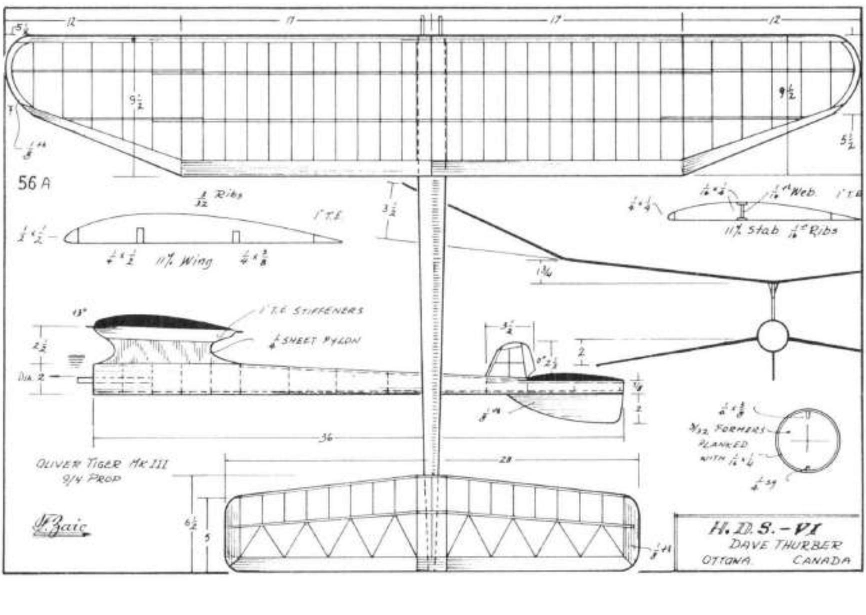

55
NB: Volgens de nieuwste gegevens motor met cilinder aan rechterzijde monteren!
Alle ribben 2mm balsa
Diagonaalstijltjes 2x2 balsa
260
420
420
260
210
Vleugelprofiel (NACA 4406)
10x10
4x3
25x5
Stabiloprofiel
15x4
Vooraanzicht
Doorsnede A-A
Doorsnede B-B
3mm balsa
4x3 balsa
Instelhoek 2°
Brandstoftank
Ballastruimte
ROMP en NEK indekken met 2mm balsa
Demping 5°
1105
Alle ribben 1mm balsa
Diagonaalstijltjes 2x2 balsa
150
335
335
BEKLEDING
ROMP, dunne zijde
VLEUGEL en STABILO, dun linnen
BLACK-SHADOW
Ontwerp L. BAUSCH ARNHEM
SPANWIJDTE 1260 mm
LENGTE 1105 mm
OPP VLEUGEL 25,9 dm²
OPP STABILO 11,3 dm²
OPP TOTAAL 37,2 dm²
GEWICHT (MIN.) 450 gram
BELASTING G/O t 12,1 g/dm²
MOTOR 2,5 cc TYPHOON RACE
PROPELLOR 9"x6"


55A
PROP 7½.5"
SPANTEN EN ROMPBEKLEDING 2mm BALSA
ROMPDOORSNEDE
LIJMLIGGERS
4x4 BALSA
15x3
BOCHTENROERTJE
RUIMTE VOOR TANK
1140
VLEUGELPLANKJE 5mm BALSA
1mm TRIPLEX
235
650
235
57
133
50
3x3 BALSA
15x3 BALSA
HULPVLEUGELVLAKJES 2mm BALSA
BEPLATING 1mm BALSA
10x10 BALSA
3x3 VUREN
ALLE RIBBEN 2mm BALSA
25x5 BALSA
3x3 VUREN
310
100
140
Door kleine wijziging aan rompneus ook voor motoren met flenzen geschikt te maken.
RIBBEN 1mm BALSA
2x2 BALSA
40
BLACK-MAGIC III
MODELMOTORVLIEGTUIG
ONTWERP L. BAUSCH
SPANWIJDTE 1040 mm
LENGTE 1140 mm
VLEUGEL OPP 18,5 dm²
STABILO OPP 5,8 dm²
TOTAAL OPP 24,3 dm²
TOTAAL GEWICHT 350 gram
MOTOR WEBRA 1,5 cc
G/O tot. 14,5 g/dm²
SLANKHEID VLEUGEL 5,8
STABILO 4,5
WB

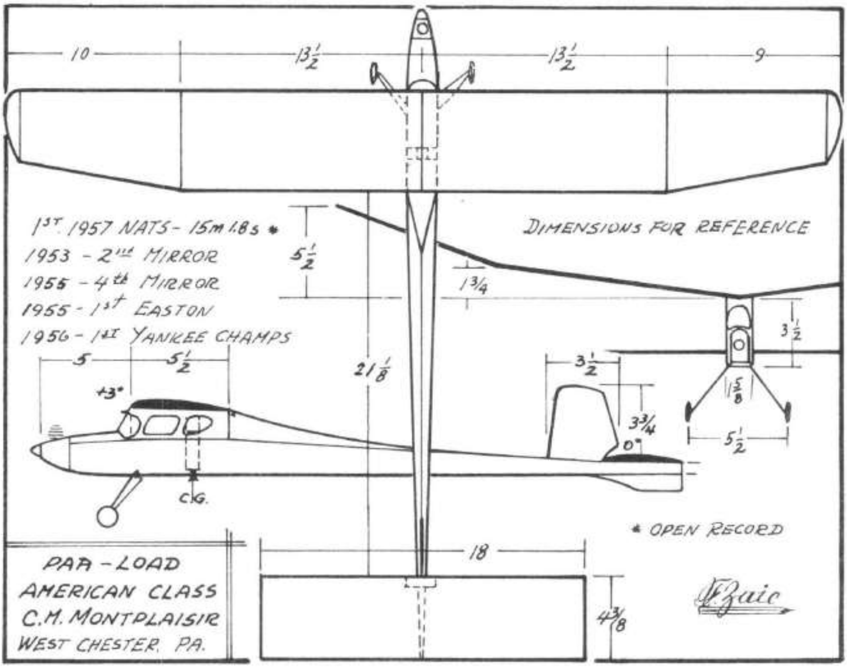
56



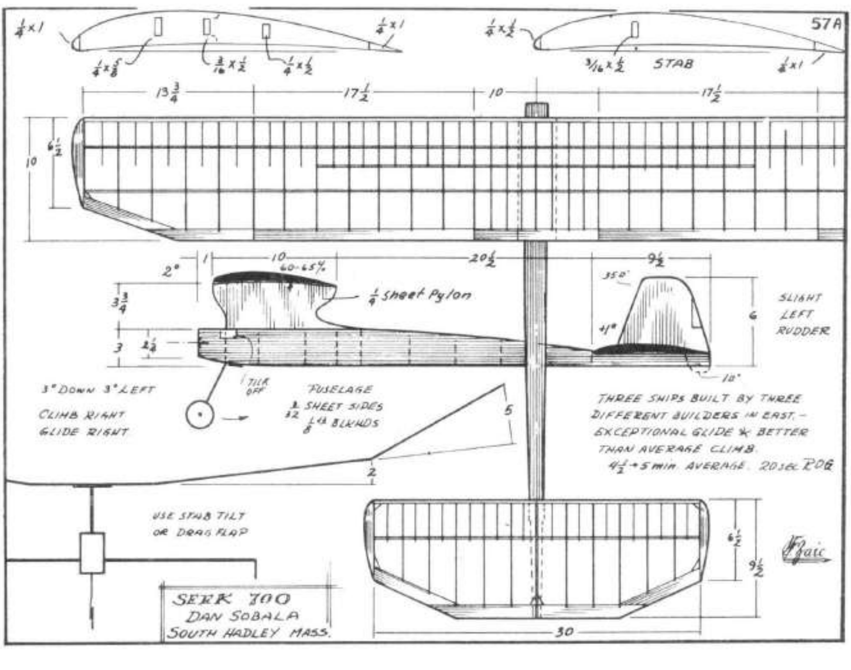
F. Zaic
MONO-WHEEL
FUSELAGE 1/8 SQ.
1ST PLACE 1957
CANADIAN NATIONALS
(198 SEC. IN 20-KNOT WIND)
HAS CLEAN TAKE-OFF &
STABLE FLIGHT PATTERN
FROM DWG IN MONTREAL
M.F.C. BULLETIN BY HAUSMAN
NOT SHOWN
'W' BRACING BETWEEN
WING & STAB RIBS
1/16 SQ SLICED RIBS
1/16 SPARS
AMERICA CLASS PAA-LOAD
by DAVE THURBER OTTAWA



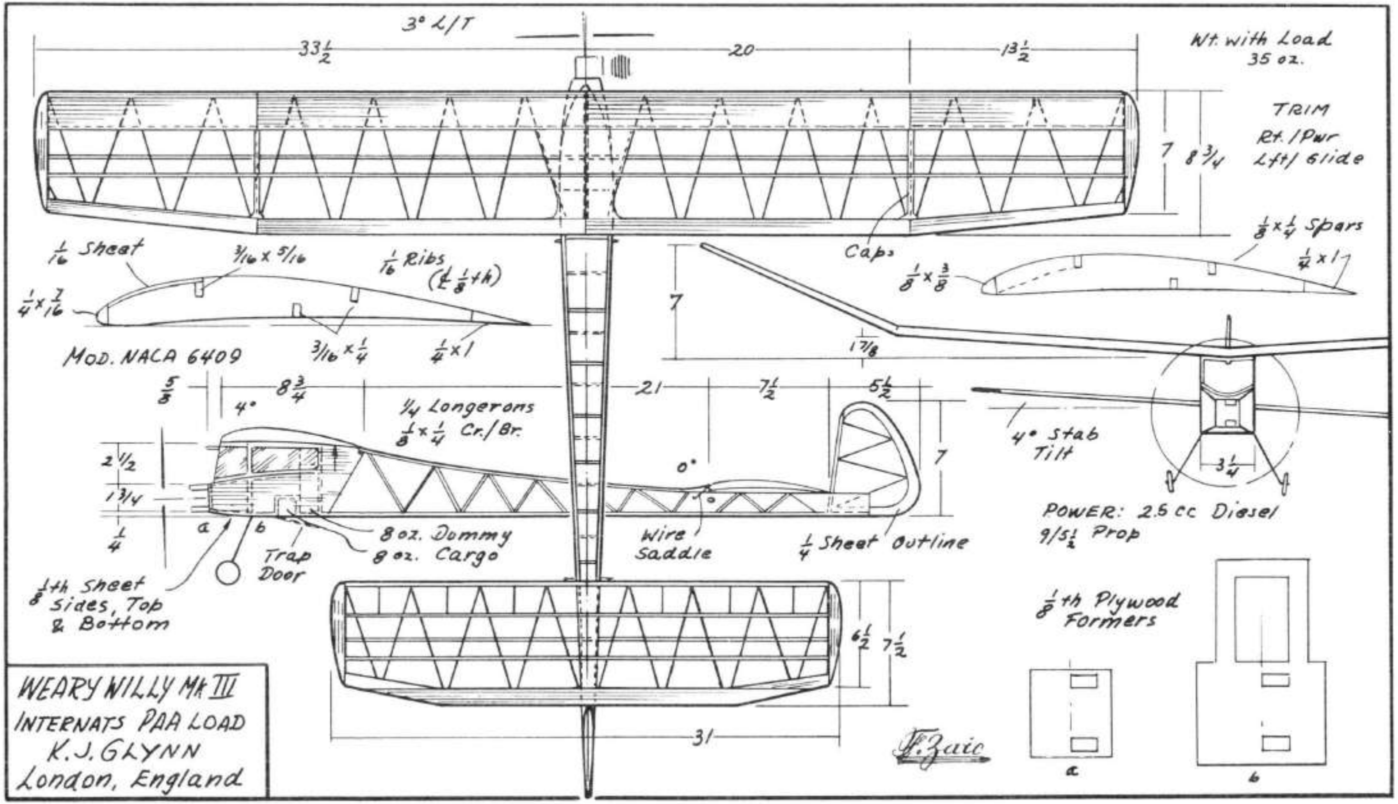
56 A
1/32 Ribs
1" T.E.
11% Wing
1/16 Web.
11% Stab 1/16" Ribs
1" T.E. STIFFENERS
1/4 SHEET PYLON
OLIVER TIGER MK III
9/4 PROP
F. Zaic
3/32 FORMERS
PLANKED
WITH 1/16 x 1/4
H.D.S.-VI
DAVE THURBER
OTTAWA CANADA

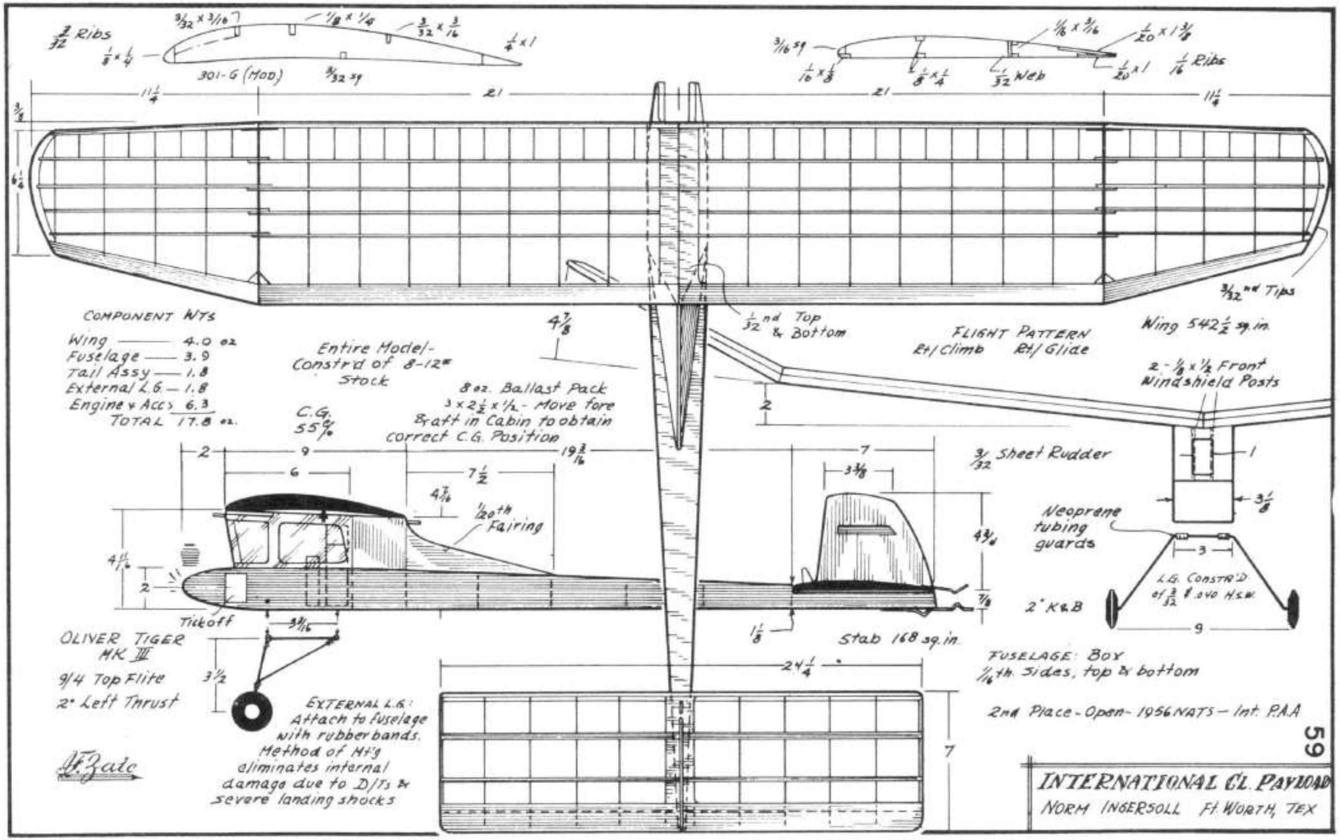


10
13 1/2
13 1/2
9
1ST 1957 NATS - 15m 1.8s *
1953 - 2nd MIRROR
1955 - 4th MIRROR
1955 - 1st EASTON
1956 - 1st YANKEE CHAMPS
DIMENSIONS FOR REFERENCE
5 1/2
1 3/4
3 1/2
21 1/8
5
5 1/2
+3°
3 1/2
3 3/4
1 5/8
5 1/2
0°
C.G.
* OPEN RECORD
18
4 3/8
PAA-LOAD
AMERICAN CLASS
C.M. MONTPLAISIR
WEST CHESTER PA.
Zaic

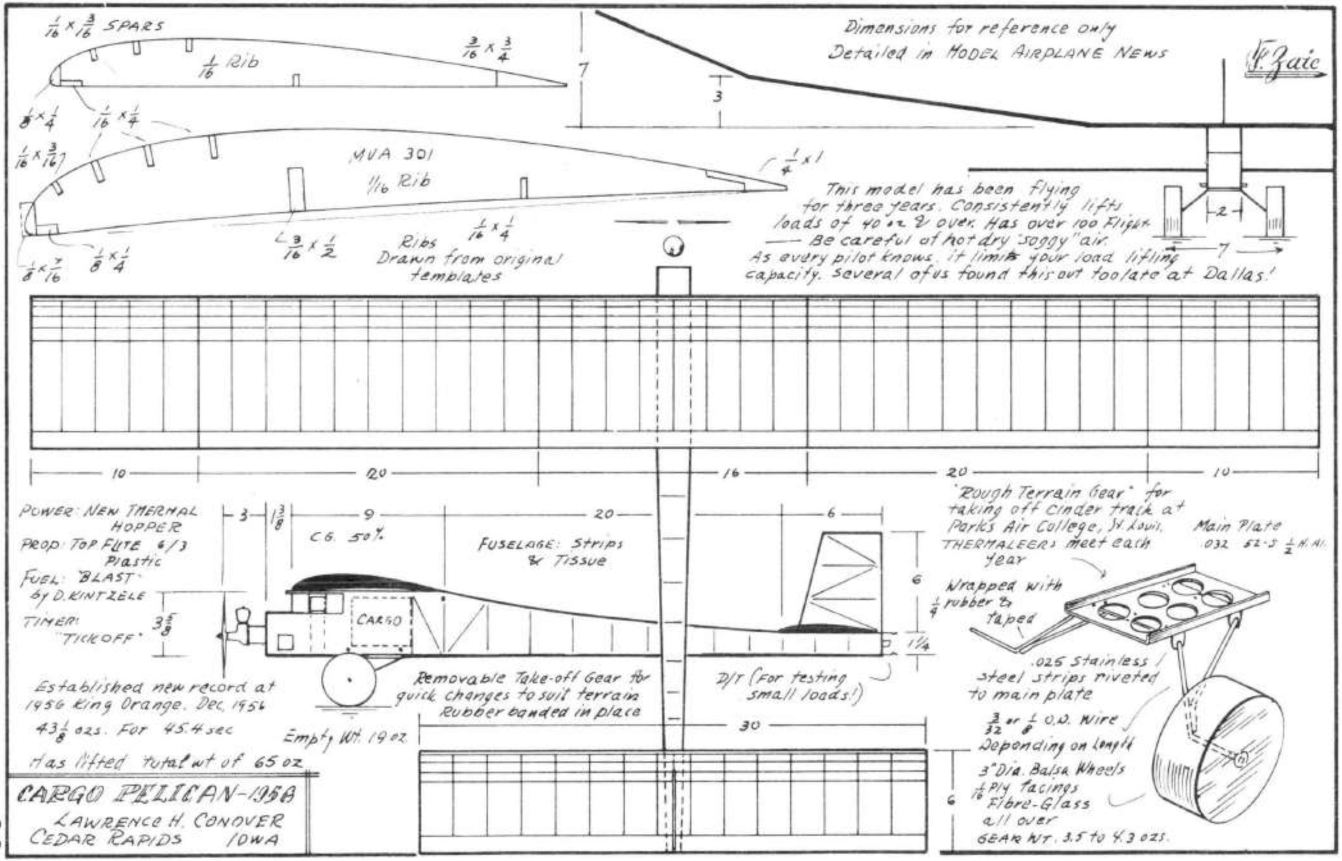


57A
1/4 x 1
1/4 x 1
1/4 x 5/8
3/16 x 1/2
1/4 x 1/2
1/4 x 1/2
3/16 x 1/2
STAB
1/8 x 1
13 3/4
17 1/2
10
17 1/2
6 1/2
10
2°
1
10
60-65%
20 1/2
9 1/2
350°
3 3/4
1/4 sheet Pylon
SLIGHT
LEFT
RUDDER
6
4°
3
2 1/4
10°
3° DOWN 3° LEFT
CLIMB RIGHT
GLIDE RIGHT
TILT OFF
FUSELAGE
1/32 SHEET SIDES
1/8 1/4 BLKHDS
5
THREE SHIPS BUILT BY THREE
DIFFERENT BUILDERS IN EAST. -
EXCEPTIONAL GLIDE & BETTER
THAN AVERAGE CLIMB.
4 1/2 + 5 min. AVERAGE. 20 sec. ROG
2
USE STAB TILT
OR DRAG FLAP
6 1/2
9 1/2
Zaic
SERK 700
DAN SOBALA
SOUTH HADLEY MASS.
30

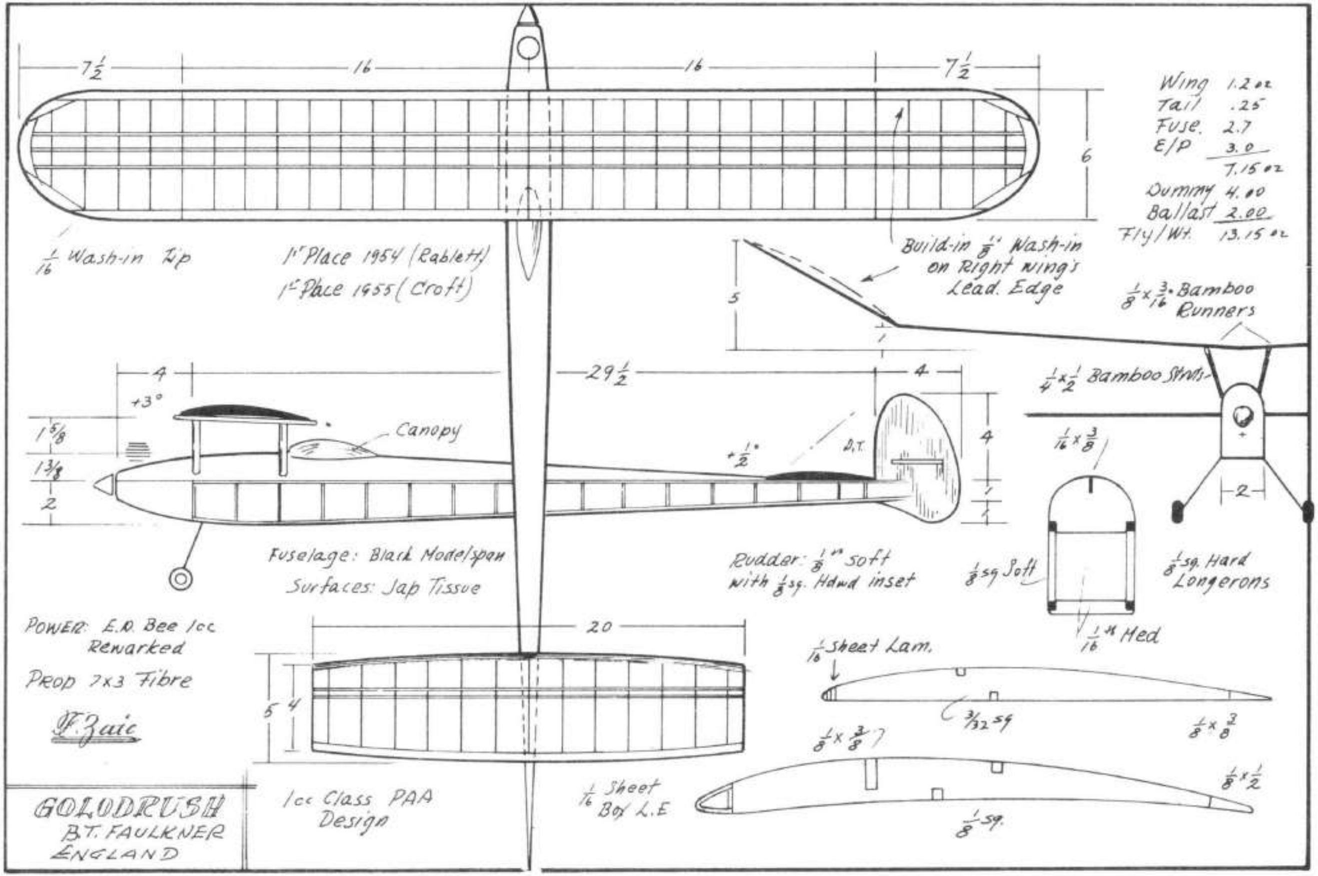

3° L/T
33 1/2
20
13 1/2
Wt. with Load
35 oz.
TRIM
Rt. / Pwr
Lft / Glide
7
8 3/4
1/8 x 1/4 Spars
Caps
1/16 Sheet
3/16 x 5/16
1/16 Ribs
(⅛ 1/8 th)
1/4 x 7/16
3/16 x 1/4
1/4 x 1
Mod. NACA 6409
1/8 x 3/8
1/4 x 1
7
1 7/8
5/8
8 3/4
4°
21
7 1/2
5 1/2
1/4 Longerons
1/8 x 1/4 Cr./Br.
0°
7
4° Stab
Tilt
3 1/4
2 1/2
1 3/4
1/4
a
b
8 oz. Dummy
8 oz. Cargo
Trap
Door
Wire
Saddle
1/4 Sheet Outline
POWER: 2.5 cc Diesel
9/5 1/2 Prop
1/8 th Sheet
Sides, Top
& Bottom
1/8 th Plywood
Formers
6 1/2
7 1/2
31
F. Zaic
a
b
WEARY WILLY Mk III
INTERNATS PAA LOAD
K. J. GLYNN
London, England



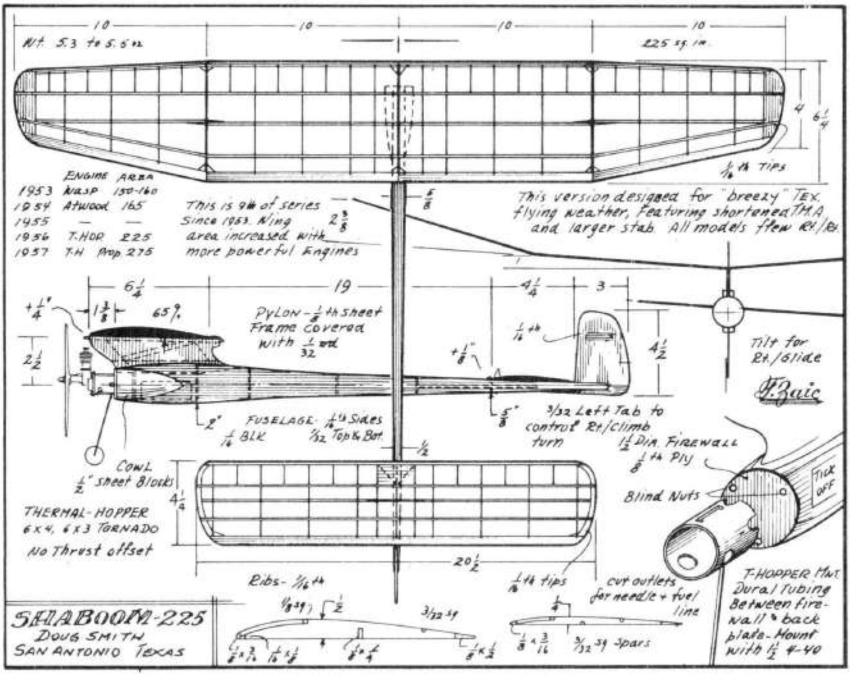
Ribs
301-G (MOD)
Wing 542½ sq. in.
COMPONENT WTS
Wing — 4.0 oz
Fuselage — 3.9
Tail Assy — 1.8
External L.G. — 1.8
Engine + Accs 6.3
TOTAL 17.8 oz.
Entire Model-
Constr'd of 8-12#
Stock
8 oz. Ballast Pack
Move fore & aft in Cabin to obtain correct C.G. Position
C.G. 55%
Top & Bottom
FLIGHT PATTERN
Rt/Climb Rt/Glide
Front Windshield Posts
Sheet Rudder
Fairing
Neoprene tubing guards
L.G. CONSTR'D
2° K&B
Tickoff
OLIVER TIGER MK III
9/4 Top Flite
2° Left Thrust
Stab 168 sq. in.
FUSELAGE: BOX
Sides, top & bottom
EXTERNAL L.G.:
Attach to fuselage with rubber bands.
Method of Mt'g eliminates internal damage due to D/Ts & severe landing shocks
2nd Place - Open - 1956 NATS - Int. P.A.A.
INTERNATIONAL CL. PAYLOAD
NORM INGERSOLL Ft. WORTH, TEX



1/16 x 3/16 SPARS
1/16 Rib
3/16 x 3/4
1/8 x 1/4
1/16 x 1/4
1/16 x 3/16
MVA 301
1/16 Rib
1/4 x 1
1/8 x 7/16
1/8 x 1/4
3/16 x 1/2
Ribs Drawn from original templates
1/16 x 1/4
Dimensions for reference only
Detailed in MODEL AIRPLANE NEWS
F. Zaic
This model has been flying for three years. Consistently lifts loads of 40 oz & over. Has over 100 Flight
— Be careful of hot dry "soggy" air.
As every pilot knows, it limits your load lifting capacity. Several of us found this out too late at Dallas!
POWER: NEW THERMAL HOPPER
PROP: TOP FLITE 6/3 Plastic
FUEL: "BLAST" by D. KINTZELE
TIMER: "TICKOFF"
C.G. 50%
FUSELAGE: Strips & Tissue
CARGO
Removable Take-off Gear for quick changes to suit terrain Rubber banded in place
D/T (For testing small loads!)
Established new record at 1956 King Orange, Dec. 1956
43 1/8 ozs. For 45.4 sec
Empty Wt. 19 oz.
Has lifted total wt of 65 oz
"Rough Terrain Gear" for taking off cinder track at Parks Air College, St. Louis. THERMALEERS meet each year
Main Plate .032 52-S 1/2 H. Al.
Wrapped with 1/4 rubber & taped
.025 Stainless steel strips riveted to main plate
3/32 or 1/8 O.D. Wire Depending on Length
3" Dia. Balsa Wheels 1/16 Ply facings Fibre-Glass all over
GEAR WT. 3.5 to 4.3 ozs.
CARGO PELICAN-1958
LAWRENCE H. CONOVER
CEDAR RAPIDS IOWA

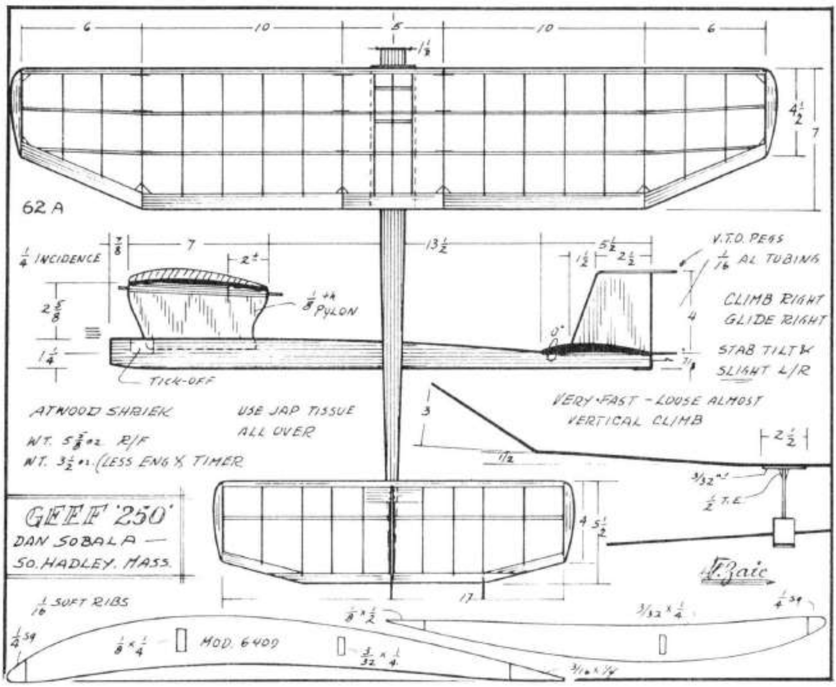


Wing 1.2 oz
Tail .25
Fuse. 2.7
E/P 3.0
7.15 oz
Dummy 4.00
Ballast 2.00
Fly/Wt. 13.15 oz
1/16 Wash-in Tip
1st Place 1954 (Rablett)
1st Place 1955 (Croft)
Build-in 1/8" Wash-in on Right wing's Lead. Edge
1/8 x 3/16 Bamboo Runners
1/4 x 1/2 Bamboo Struts
Canopy
D.T.
Fuselage: Black Modelspan
Surfaces: Jap Tissue
Rudder: 1/8" soft with 1/8 sq. Hdwd inset
1/8 sq Soft
1/8 sq. Hard Longerons
1/16 x 3/8
1/16" Med
POWER: E.D. Bee 1cc Reworked
Prop 7x3 Fibre
F. Zaic
1/16 Sheet Lam.
3/32 sq
1/8 x 3/8
1/8 x 1/2
1/8 sq.
1/16 Sheet Box L.E
1cc Class PAA Design
GOLDRUSH
B.T. FAULKNER
ENGLAND

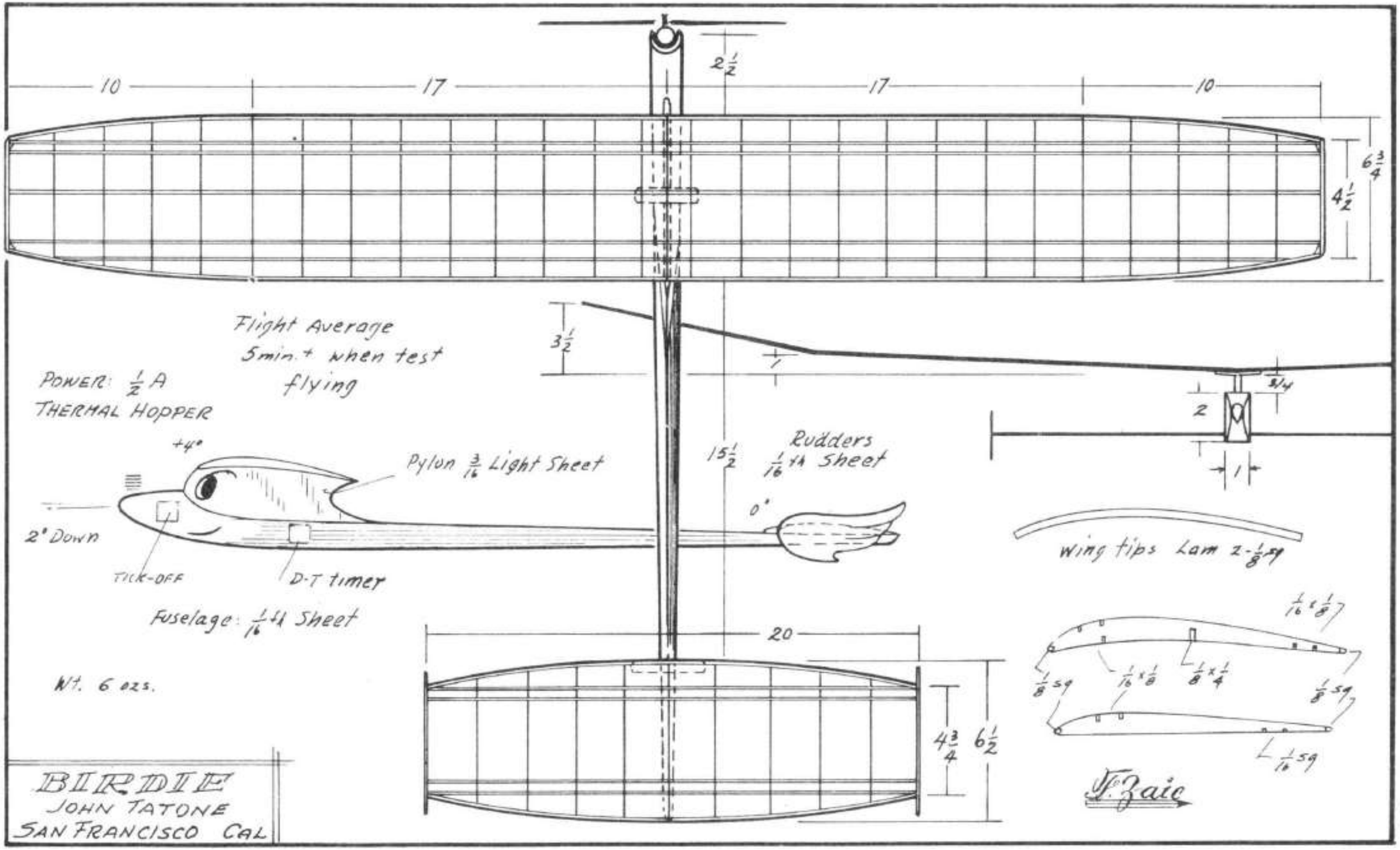


Wt. 5.3 to 5.5 oz
225 sq. in.
ENGINE AREA
1953 WASP 150-160
1954 Atwood 165
1955 — —
1956 T.HOP 225
1957 T.H Prop. 275
This is 9th of series Since 1953. Wing area increased with more powerful Engines
This version designed for "breezy" TEX. flying weather, Featuring shortened T.H.A and larger stab. All models flew Rt./Rt.
1/16 th TIPS
Pylon - 1/8 th sheet Frame covered with 1/32 nd
Tilt for Rt./Glide
3/32 Left Tab to control Rt./climb turn
FUSELAGE- 1/16 th Sides 1/16 BLK 3/32 Top & Bot.
1 1/2 Dia. FIREWALL 1/8 th Ply
Blind Nuts
TICK OFF
COWL 1/2" sheet Blocks
THERMAL-HOPPER 6x4, 6x3 TORNADO
No Thrust offset
Ribs- 1/16 th
1/16 th tips
cut outlets for needle + fuel line
3/32 sq Spars
T-HOPPER Mnt. Dural Tubing Between fire-wall & back plate- Mount with 1/2 4-40
SHABOOM-225
DOUG SMITH
SAN ANTONIO TEXAS

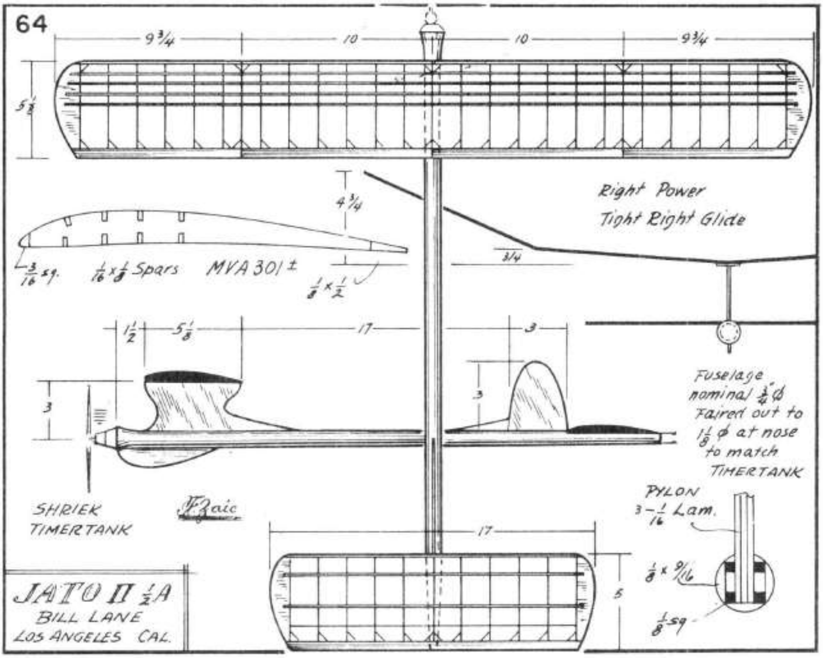
62 A



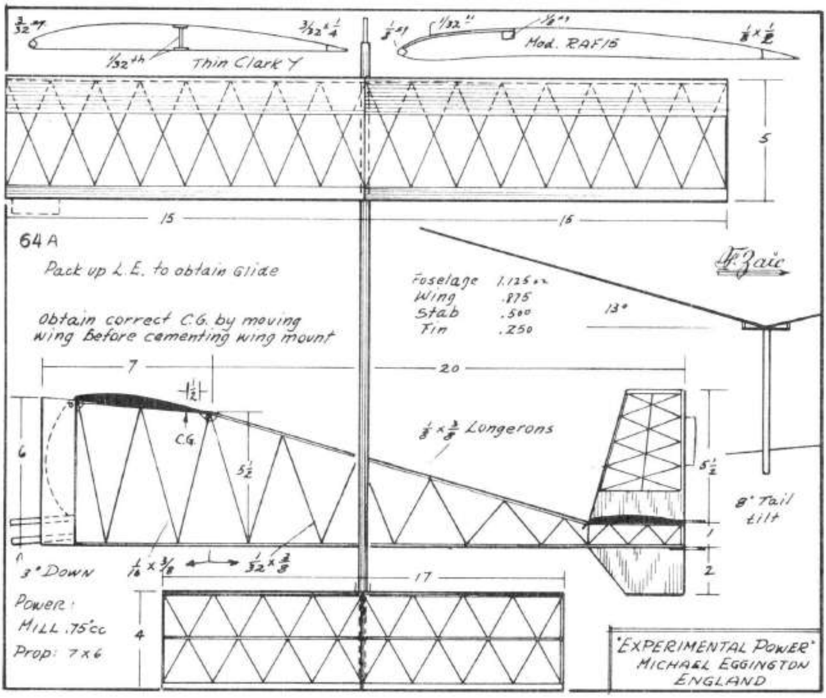
1/4 INCIDENCE
1/8 th PYLON
TICK-OFF
V.T.O. PEGS 1/16 AL TUBING
CLIMB RIGHT
GLIDE RIGHT
STAB TILT & SLIGHT L/R
VERY FAST - LOOSE ALMOST VERTICAL CLIMB
ATWOOD SHRIEK
USE JAP TISSUE ALL OVER
WT. 5 7/8 oz R/F
WT. 3 1/2 oz (LESS ENG & TIMER
1/2 T.E.
GEEF '250'
DAN SOBALA —
SO. HADLEY. MASS.
1/16 SOFT RIBS
MOD. 6409



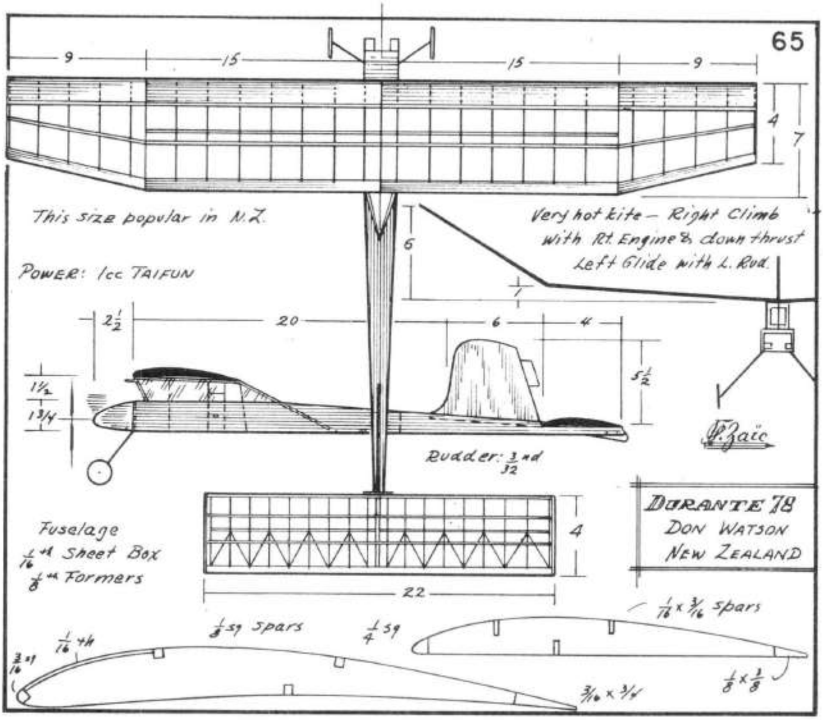
10
17
17
10
2 1/2
6 3/4
4 1/2
3 1/2
1
3/4
2
1
15 1/2
20
4 3/4
6 1/2
Flight Average 5 min.+ when test flying
POWER: 1/2 A
THERMAL HOPPER
+4°
Pylon 3/16 Light Sheet
Rudders 1/16 th Sheet
0°
2° Down
TICK-OFF
D-T timer
Fuselage: 1/16 th Sheet
Wt. 6 ozs.
wing tips Lam 2-1/8 sq
1/16 x 1/8
1/8 sq
1/16 x 1/8
1/8 x 1/4
1/8 sq
1/16 sq
BIRDIE
JOHN TATONE
SAN FRANCISCO CAL
F. Zaic

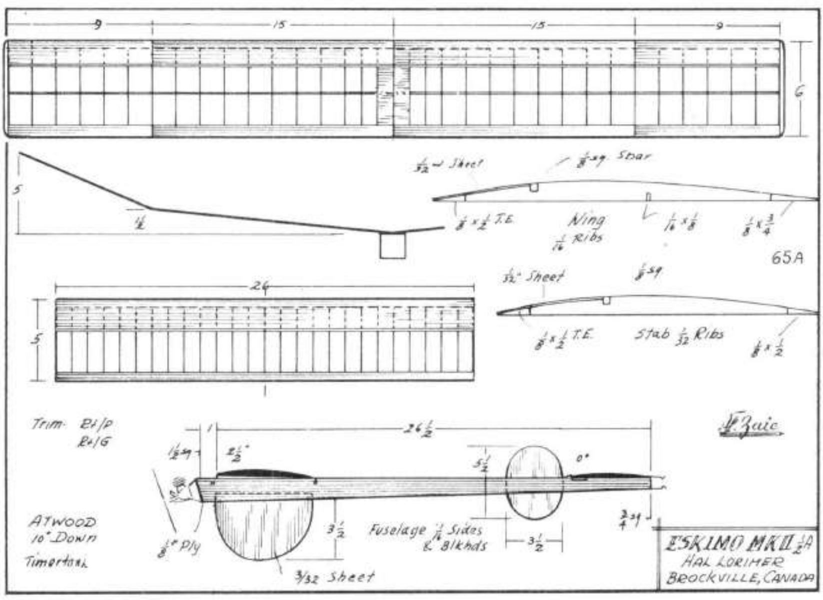


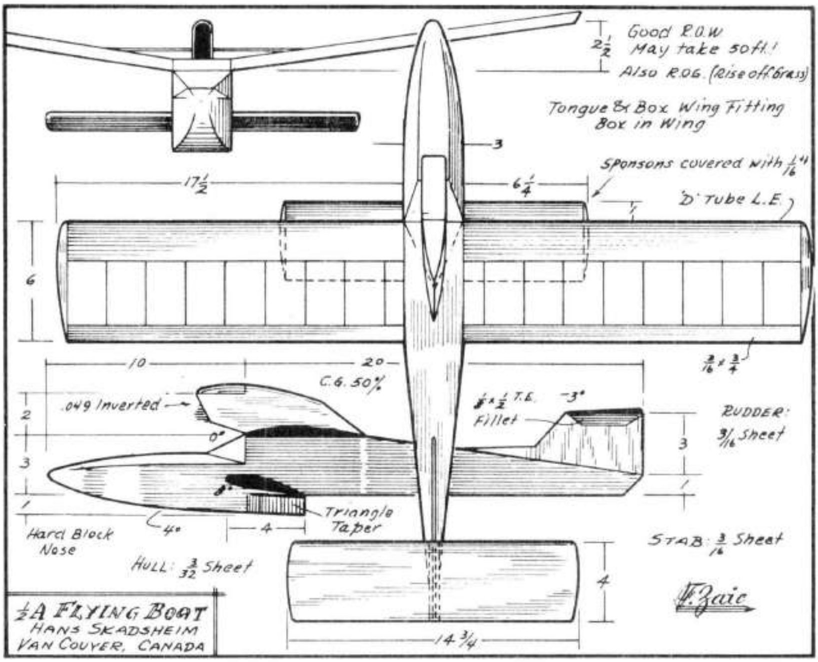
64
9 3/4
10
10
9 3/4
5 1/8
4 3/4
3/16 sq.
1/16 x 1/8 Spars
MVA 301 ±
1/8 x 1/2
3/4
Right Power
Tight Right Glide
1 1/2
5 1/8
17
3
3
3
Fuselage nominal 3/4" ⌀ Faired out to 1 1/8 ⌀ at nose to match TIMERTANK
SHRIEK TIMERTANK
F. Zaic
PYLON 3 - 1/16 Lam.
17
5
1/8 x 9/16
1/8 sq
JATO II 1/2A
BILL LANE
LOS ANGELES CAL.

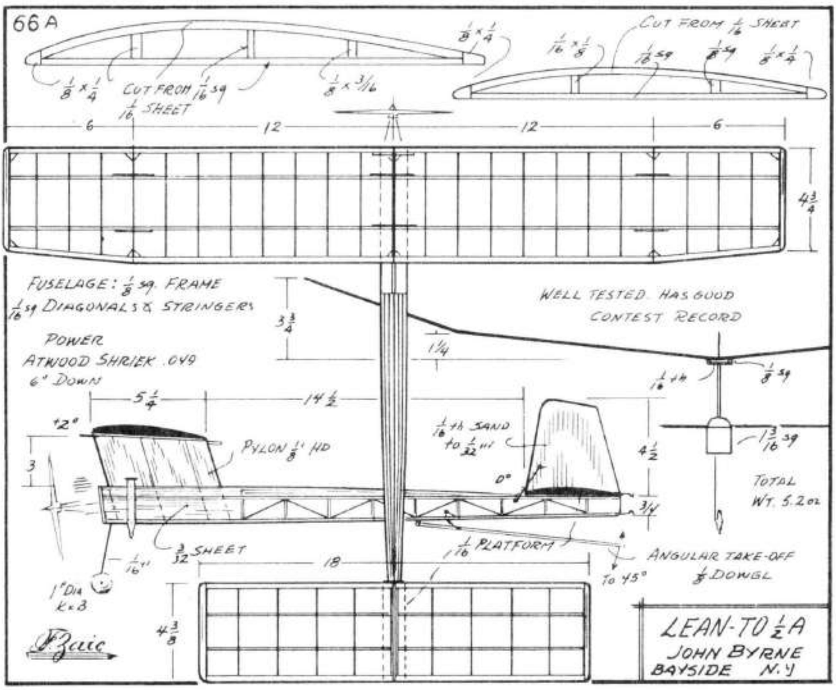


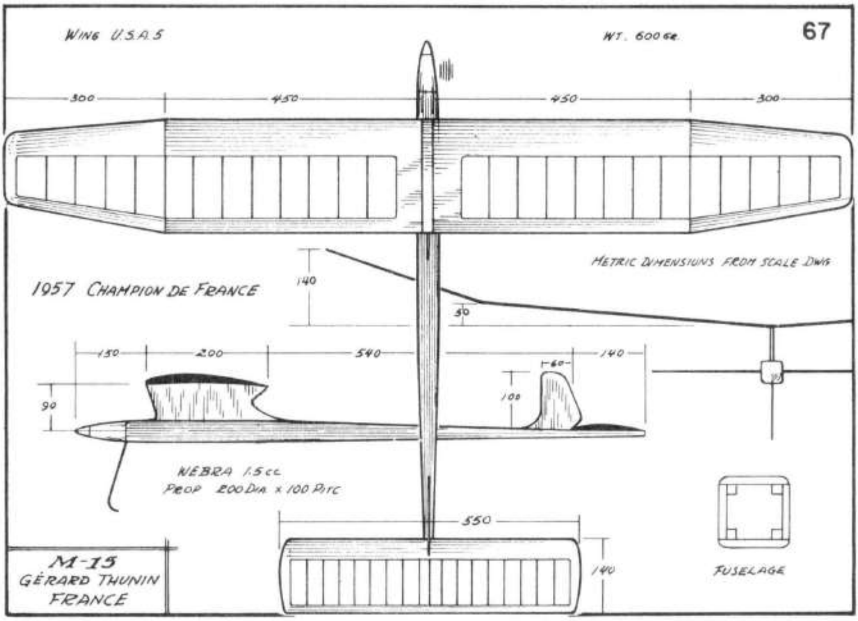
3/32 sq
3/32 x 1/4
1/32 sh
Thin Clark Y
1/8 sq
1/32"
1/8 sq
Mod. RAF15
1/8 x 1/2
5
15
16
64 A
Pack up L.E. to obtain Glide
Obtain correct C.G. by moving wing before cementing wing mount
Fuselage 1.125 oz
Wing .875
Stab .500
Fin .250
13°
F. Zaic
7
20
1 1/2
C.G.
5 1/2
1/8 x 3/8 Longerons
6
5 1/2
8° Tail tilt
1
2
3° Down
1/16 x 3/8
1/32 x 3/8
17
Power: MILL .75cc
Prop: 7 x 6
4
"EXPERIMENTAL POWER"
MICHAEL EGGINGTON
ENGLAND

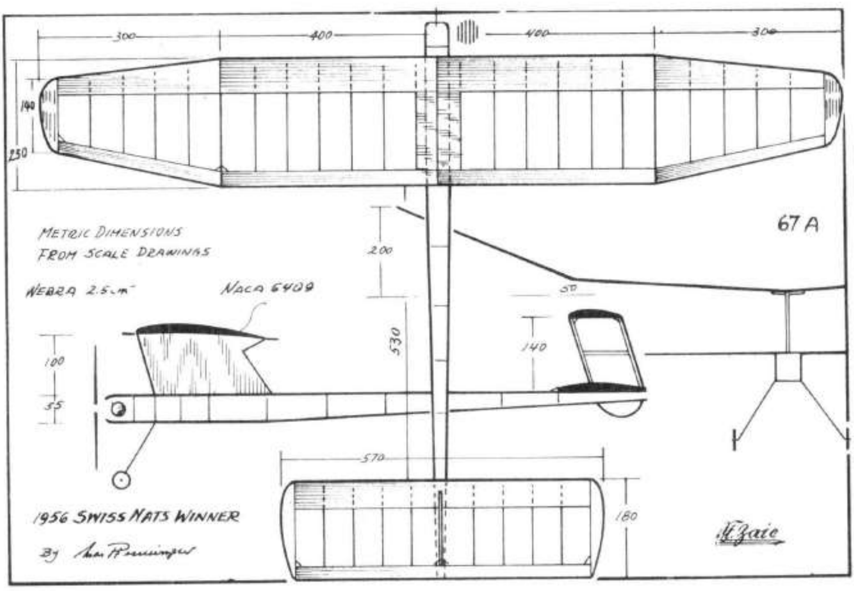

65
9
15
15
9
4
7
This size popular in N.Z.
Very hot kite – Right Climb
with Rt. Engine & down thrust
Left Glide with L. Rud.
POWER: 1cc TAIFUN
6
1
2½
20
6
4
5½
1½
1¾
Rudder: 3/32
F. Zaïc
DURANTE 78
DON WATSON
NEW ZEALAND
Fuselage
1/16 Sheet Box
1/8 Formers
4
22
1/16 x 3/16 Spars
1/8 sq Spars
1/4 sq
1/16
3/16 sq
3/16 x 3/4
1/8 x 3/8

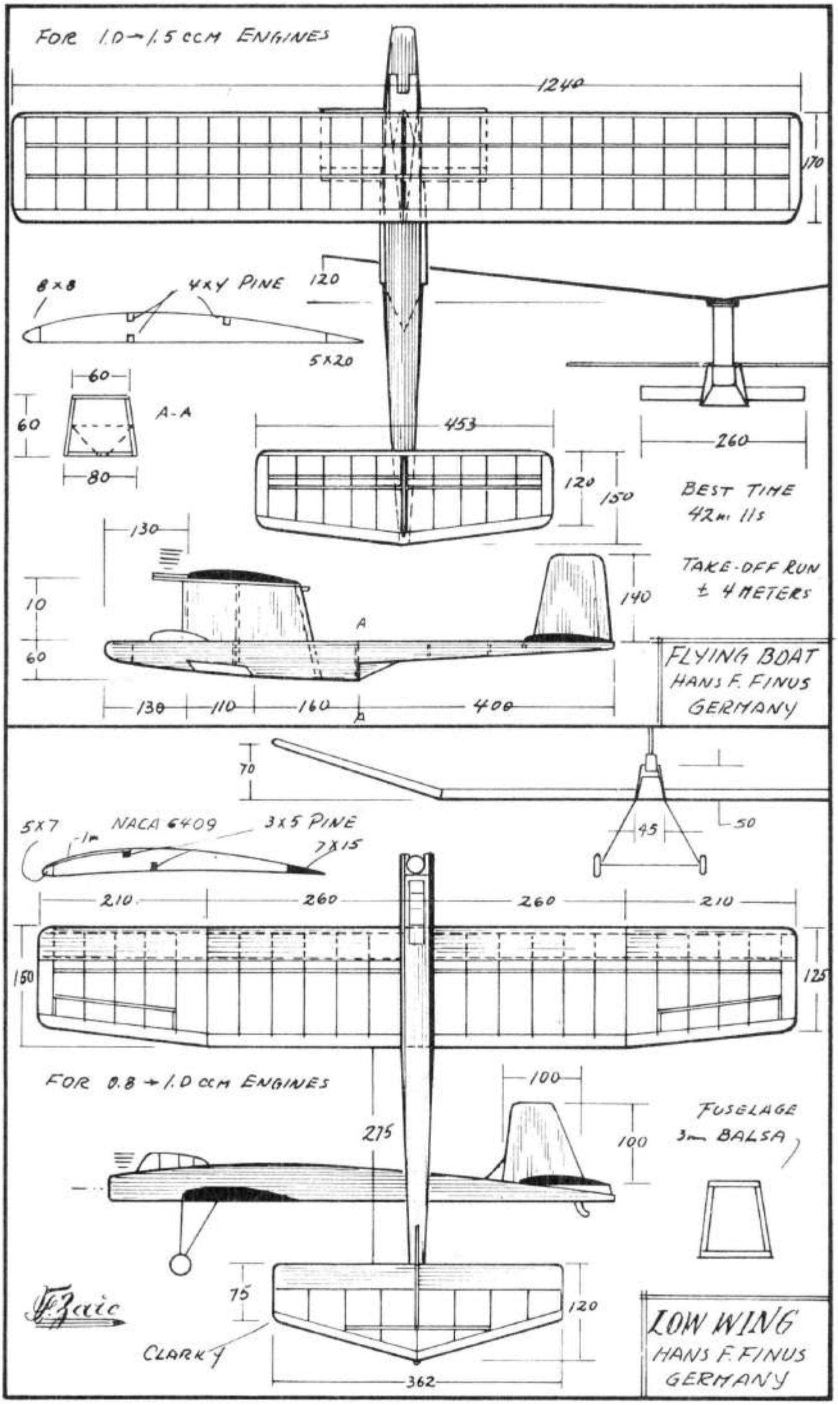

9
15
15
9
6
1/32 Sheet
1/8 sq Spar
5
½
1/8 x ½ T.E.
Wing
1/16 Ribs
1/16 x 1/8
1/8 x 3/4
65A
24
1/32 Sheet
1/8 sq
5
1/8 x ½ T.E.
Stab 1/32 Ribs
1/8 x ½
F. Zaïc
Trim Rt/P
Rt/G
26½
1/8 sq
2½
5½
0°
ATWOOD
10° Down
Timertank
1/8 Ply
3½
Fuselage 1/16 Sides
& 1/8 Blkhds
3½
3/4 sq
3/32 Sheet
ESKIMO MK II ½A
HAL LORIMER
BROCKVILLE, CANADA

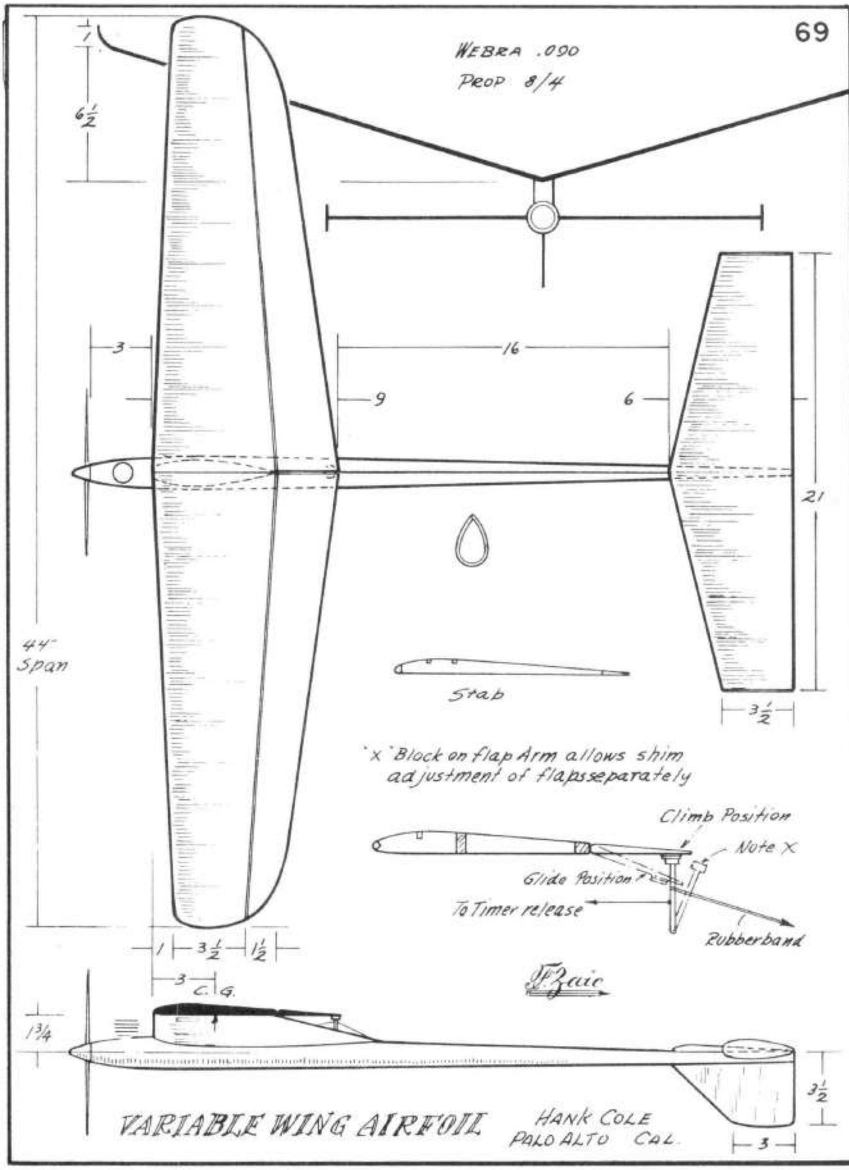

Good R.O.W
May take 50ft.!
Also R.O.G. (Rise off Grass)
Tongue & Box Wing Fitting
Box in Wing
Sponsons covered with 1/16
'D' Tube L.E.
.049 Inverted
C.G. 50%
Fillet
RUDDER: 3/16 Sheet
Triangle Taper
Hard Block Nose
HULL: 3/32 Sheet
STAB: 3/16 Sheet
1/2A FLYING BOAT
HANS SKADSHEIM
VAN COUVER, CANADA
F. Zaic


66A
CUT FROM 1/16 SHEET
FUSELAGE: 1/8 sq. FRAME
1/16 sq. DIAGONALS & STRINGERS
POWER
ATWOOD SHRIEK .049
6° DOWN
WELL TESTED. HAS GOOD
CONTEST RECORD
PYLON 1/8" HD
1/16 th SAND to 1/32"
3/32 SHEET
1/16 PLATFORM
ANGULAR TAKE-OFF
1/8 DOWEL
TOTAL WT. 5.2 oz
1" DIA K&B
LEAN-TO 1/2A
JOHN BYRNE
BAYSIDE N.Y.
F. Zaic


WING U.S.A.5
WT. 600 GR.
67
300
450
450
300
1957 CHAMPION DE FRANCE
METRIC DIMENSIONS FROM SCALE DWGS
140
30
150
200
540
140
60
90
100
NEBRA 1.5 cc
PROP 200 DIA x 100 PITC
550
140
FUSELAGE
M-15
GÉRARD THUNIN
FRANCE


300
400
400
300
140
230
67 A
METRIC DIMENSIONS
FROM SCALE DRAWINGS
200
NEBRA 2.5 cm³
NACA 6409
50
530
100
140
35
570
180
1956 SWISS NATS WINNER
By


FOR 1.0→1.5 CCM ENGINES
1240
170
8×8
4×4 PINE
120
5×20
60
60
A-A
80
453
260
120
150
BEST TIME
42m 11s
130
10
60
140
A
TAKE-OFF RUN
± 4 METERS
FLYING BOAT
HANS F. FINUS
GERMANY
130
110
160
400
70
5×7
NACA 6409
3×5 PINE
7×15
45
50
210
260
260
210
150
125
FOR 0.8→1.0 CCM ENGINES
100
275
100
FUSELAGE
3mm BALSA
75
120
CLARK Y
362
LOW WING
HANS F. FINUS
GERMANY



VARIABLE WING AIRFOIL

HANK COLE
PALO ALTO CAL.

RAMROD NOTES

FROM JUNE 1956 M.A.N.

by Ron St. Jean Los Angeles, Calif.

RAMROD is the culmination of many years of trial and error designing. It started in 1948 after the Olatha Nationals. Three other designs seemed outstanding in my mind and my purpose was to produce a model better than any of the three, combining what I consider the best points of each. (Designs in question were successful in competition but were not good enough to perpetuate themselves.) Ramrod, I am certain, can sustain itself and grow, because it is a bugless design.

The RAMROD design was finalized in the Fall of 1954. Then another problem arose: What was the best size model to build for each engine I was using?

Until that time I had been going on the "hotter the better" theory, where one attempts to put his little skyrocket all but out of sight in the alloted 20 sec., hoping it will take five minutes and 40 seconds to fall through, even with its poor glide. At this time the .19—.23 RAMROD had 350 sq. in. of wing area. This was a four minute model but had the following bad features:

1. It was stable under power, but hard to control, since it was so sensitive about the rudder adjustments.
2. A re-check was necessary at each flying session, because of very slight warp changes.
3. The glide was fast enough with its high wing loading to cause many broken props and rips in covering.

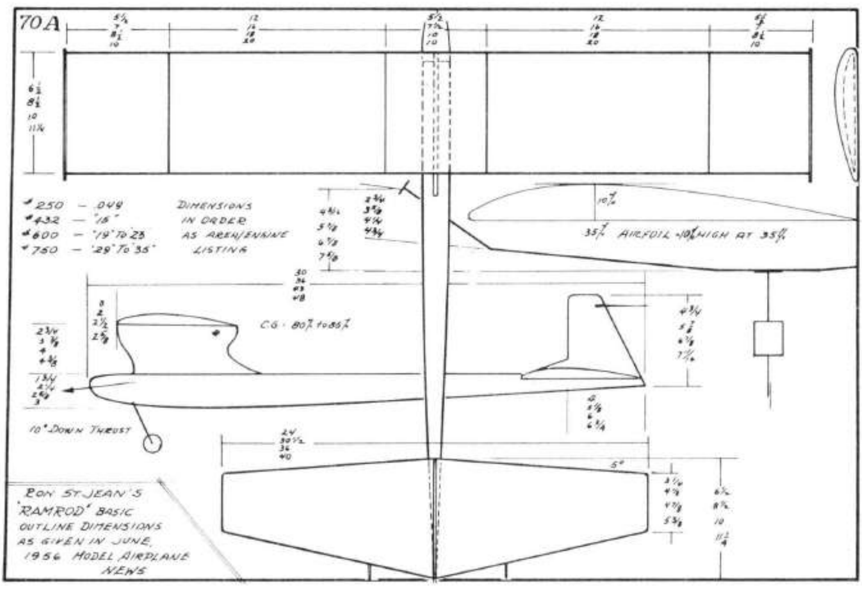
These disadvantages of the "the hotter the better" theory began to make clear the advantages of the "powered glider" theory. Building a model as large as possible without going far overweight does away with all the disadvantages of the small ship and in addition does one more important thing: It reduces the "sinking speed" of the model so that it can be suspended by a weak thermal, while the smaller one would drop right through.

I firmly believe that we can safely throw most of our old spiral stability theories into the scrap box and substitute that I shall call, for lack of a better phrase, the "top rudder theory." My contention is that to insure a design to be spirally stable we need do only two things:

1. Provide in the design sufficient decalage, dihedral and rudder so that we will have, respectively ample longitudinal, lateral and directional stability.
2. Design or adjust our model so that it will climb against rudder. In this way the rudder offset will help hold the tail down in a steep bank. (Set rudder slightly "left" for "right" bank.)

Note that a 10 degree angle of downthrust is used. Unless there is something wrong with your version of RAMROD, it will require every bit of 10 degrees, so build it right into any RAMROD.

Although RAMROD uses no sidethrust, it is the 10 degrees of downthrust which facilitates vertical take-offs. The down-thrust is very effective at low air speeds and will lean the RAMROD (or any model with a great deal of downthrust) forward into a normal flying altitude soon after it leaves the ground. Thus it is unnecessary to lean this type of model forward "on" the ground for a VTO. Try it sometimes. You will be amazed at the ease with which your model will VTO.



FLIGHT OBSERVATION – WAKEFIELD (AND NORDICS)

by Jim Horton Baltimore, Mr.

I have had a real wild summer. Nine out of sight flights in four contests. However, the jobs just are not consistent. I read Stuart Savage's article in your 56 book and that boy is on the right track. Forget about dead air time and adjust for contest conditions, i.e. 15-25 mph with gusts and heat. Nolan's article was also good.

We did a great deal of test work—not at nite as before—but at noon when the wind and heat are up. Your statement on page 55 of your 51 book about bouncing characteristics covers a lot of ground.

Well, to make a long story short, I finally did what I have never been able to do before: Six maxs with 1.8 oz. of rubber (in a row). But the ship (Wakefield) looks like a ruptured duck in dead air (late at nite) and only does 2:30. You figure that one out. To add to insult, my buddy Mazan was doing 3:15 in dead air, and could not get up over 200 ft. in the same air I made my six maxs flights.

As we are still fighting this thing out I will not give you a lot of premature info. All I can say is that there is as much difference between flying in contest conditions and late at nite as there is between statics and dynamics.

It gets to be rough, though—I forgot to lite Mazan's fuze and he stayed up about an hour—drifting up-wind in the heat. We are going to fly every free day we have until we arrive at a design that will do the trick.

Here is an interesting little thing: In the calm, a high powered ship will shoot straight up to about 200 feet on initial burst. In a good wind it will reach about 100 feet as the wind loads the wing down with excess lift and drag. So if you lose the first burst and the second turn in the wind you are not going very high with a short burst. The long run job loses the first and second turn but still has a long run and it is in a much better position to win. Then there is the matter of bounce, if the long run job bounces up every time it turns into the wind and has a long run—even at a slow rate of climb—it will end up way up.

Well, so far your ideas on glider adjustment in the 51 book seem to be what we are ending up with (after years of research in dead air). This should make you happy but it makes me sad. I always had the happy idea that the same ships that beat me in competition would be clunks without heat. (The big mistake is that we should not be designing for dead air, but rough weather.)

December 20, 1956

Nothing much new at this end except that we fly every chance we get. Have just about reached a good combination for the new 50 gram rules on Wakefield.

I am enclosing plans which you might care to use. At least you will have something ahead of time to start the boys arguing. This high pitch prop (24 in.) and 15 strands of 1/4 Pirelli gives good altitude, and auto rudder is as good as an auto pilot. We switched to 60% C.G. after wind testing. The old 100% just was not consistent enough. Glider suffers a lot but when she goes, she goes up high and that seems to be winning the meets these days.

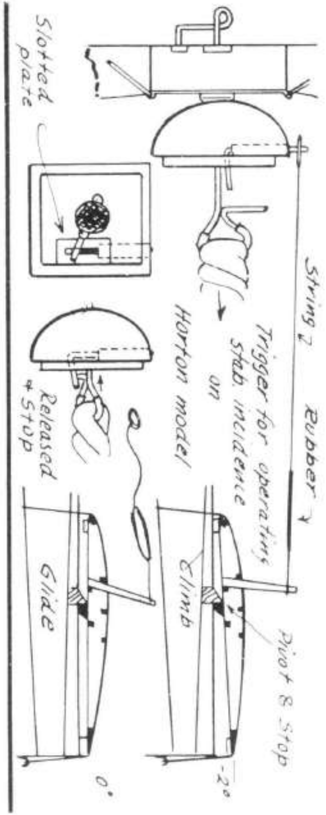
March 1, 1957

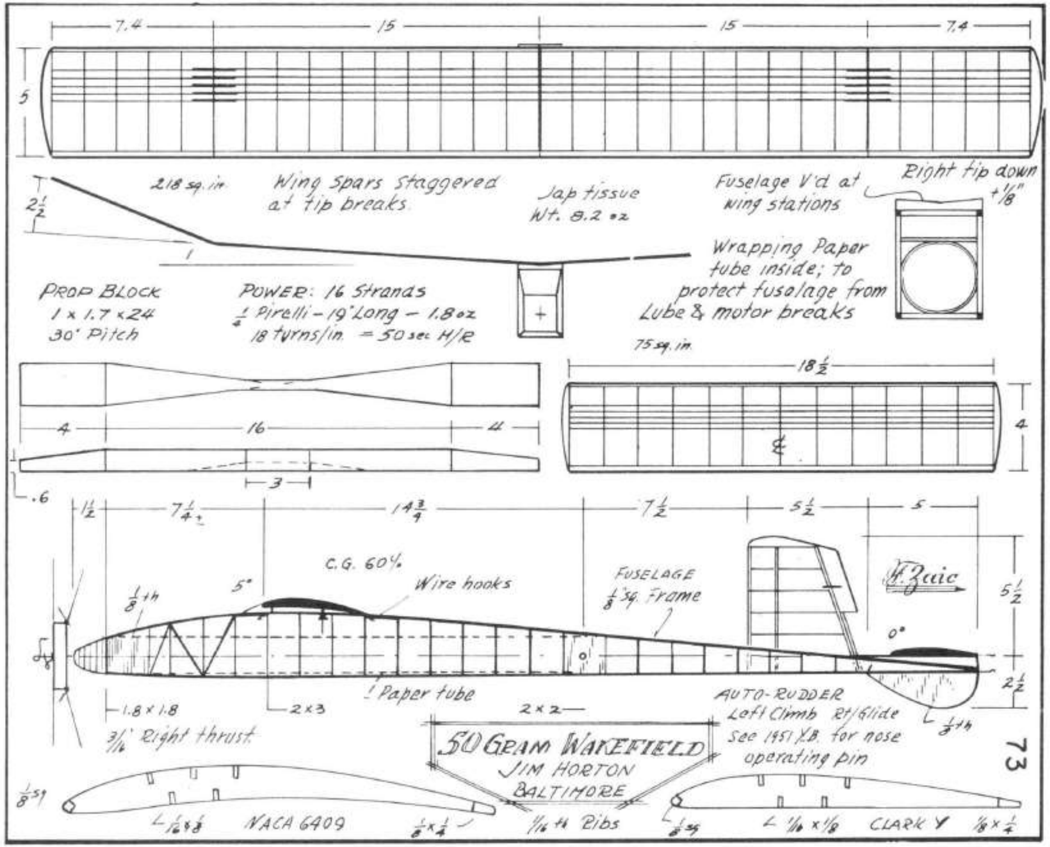
About our latest Wakefield set-up: It is an atttempt to solve a lot of little problems. As you know, we found the rt/left adjustment had one big disadvantage. You have to carry wash-in on the right wing to get a good safe right power turn. This wash-in would sometimes cause the ship to spin to the left in the glide due to turning with the warp. So the only safe set-up would be to climb right agains left rudder, then auto rudder to right for a safe right glide. I hate gadgets but this one was necessary.

After reading G. R. Nolan's and Stuart Savage's articles in your 56 book we did some checking of our jobs in windy weather and found the 60% C.G. position was way more consistent than the 100% C.G. You cannot touch the 100% C.G. in dead-late evening. But, we have to be practical. The average contest conditions are turbulent and wind at least 15 m.p.h. The 100% job gets into a semi-stalled set-up and just plain sinks. The forward 60% C.G. gives the model bounce, as you call it, and it gets out of trouble. We are shooting for tighter glide circles for this same reason. The dead air time goes down but we are not designing for dead air anymore.

The prop you may find interesting. You can carry a low pitch prop say with 12 strands and get a minute run, or high pitch prop with 16 strands and get a minute run. The big difference is that the high pitch job will really dig on the initial burst and so far has proven better. The layout is one of Ray Dietz's here in Baltimore and he could really get a rubber job up. It dates back to 1940 and if you look close you can see it is the same pitch layout as Bilgri's except that you do not have to glue two blocks together.

The paper tube in the fuselage is an example of one thing leading to another. I put a square tube in one of my jobs to keep the lube from messing up the covering job. I figured with a square nose I would need a square tube but it turned out very weak. Then Ed Mazan made a


Slotted plate
String
Rubber
Trigger for operating stab incidence on Horton model
Released & Stop
Climb
Glide
Pivot & Stop
-2°
0°


7.4
15
15
7.4
5
218 sq. in.
Wing spars staggered at tip breaks
Jap tissue Wt. 8.2 oz
Fuselage V'd at wing stations
Right tip down +1/8"
2 1/2
1
Wrapping Paper tube inside; to protect fuselage from Lube & motor breaks
PROP BLOCK
1 × 1.7 × 24
30° Pitch
POWER: 16 Strands
1/4 Pirelli – 19" Long – 1.8 oz
18 turns/in. = 50 sec. H/R
75 sq. in.
18 1/2
4
16
4
4
3
.6
1 1/2
7 1/4
14 3/4
7 1/2
5 1/2
5
C.G. 60%
5°
Wire hooks
FUSELAGE
1/8 sq. Frame
1/8 th
0°
5 1/2
2 1/2
Paper tube
1.8 × 1.8
2 × 3
2 × 2
3/16" Right thrust
AUTO-RUDDER
Left Climb Rt/Glide
See 1951 Y.B. for nose operating pin
1/8 th
50 GRAM WAKEFIELD
JIM HORTON
BALTIMORE
1/8 sq
1/16 × 1/8
NACA 6409
1/8 × 1/4
1/16 th Ribs
1/8 sq
1/16 × 1/8
CLARK Y
1/8 × 1/4

round tube and pushed it through his square nose and it turned out beautiful. Then to add insult to injury we found that when Ed's motor blew up he did not have a single mark on his ship. The tube guided the broken motor thru the ship.

On my new job I used shelf paper (.004 inch) and double layered it with plenty of dope. This one looks bullet proof. I also left a large opening on top of fuselage forward of rear peg to eject broken motor. I picked up some thin fiberglass cloth at a boat store, and my next tube will be shelf paper with fiberglass on outside. After all, if we have weight to play around with, this is the place to use it. It would be real great, after all these years, to blow "them" things one after another and pay no attention to it.

Well, that about covers the Wakefield job.

I have also been busy testing a Nordic. This one we have really built in bounce. Austin Hofmeister and I cooked up a beautiful adjustable tow hook. A 3/32 x ¾ x 4½ brass plate with 10-32 tapped holes every ¼ inch. Three wood screws hold the plate to the bottom of the glider, and two machine screws hold the tow hook. Only takes a screw driver to position hook where you need it.

Have finally found construction for wings you will not be able to beat. Multi-spars backed up with sheet leading and trailing edge. Used it in on my new A2 wing. You can stand on it!

May 15, 1957

As I told you last time we changed tactics and are now testing only in wind and heat. We gave up the dead air work as useless.

To show you how time consuming this can be we used up 75 feet of fuse since last Fall, all on short (one inch fuse) test flights.

I spent all Spring testing my new A-2 glider and believe I've finally gotten a decent design. By using about ¾ inch incidence on 7 inch chord, 50% C.G. and a slight tilt in the stab I've got the monster bouncing nicely. . . Which brings us to an interesting new theory.

As you know an airplane is supposed to become a part of the air mass—that is, its airspeed upwind roughly equals airspeed downwind.

However, in model flying at the start of a flight in a 20 mile wind the model has inertia with respect to the ground. That is, if you head the model into the wind before launching you have a 20 mile airstream over the surfaces. Now, from the time of launch until it reaches a state of steady drift the airspeed varies upwind and downwind. When the ship leaves your hand into the wind it has 20 mile airspeed—as it turns downwind the airspeed decreases sharply.

Therefore in calm air testing you never really know if the model is stable because you never reach this airspeed (with a Wakefield or Nordic).

A good example of this is my short burst rubber job. In dead air it hits constant 3 min. flights. In a 30 mile wind the first two power turns look like it is dragging City Hall behind it. (This is due to the terrific drag caused by the high airspeed from wind.)

I ran into the same thing with the Nordic. It actually makes better time when I stall it off the line than when I float it off into the wind. The stall dumps the excess drag and lift, and gets it into its circle with very little lost altitude. If I float it off it sinks like a brick the first couple of turns (which, incidentally, are very large due to high wing forces reducing rudder tab effect.)

As you know I was working on an elevator to allow my tow hook to be moved forward for the tow stability. I get the same effect on my new ship by carrying high incidence in the wing, and tight turn in the glide. The glide speed is very low so the tow speed can also be very low with hook about 2 inches ahead of C.G. This gives very good control. I can pull the ship around in any direction. If I move the hook back to the C.G. I lose this couple and the forward wing keeps on lifting once the model peels off, and it is impossible to pull it back. So you can see that the tow stability is a function of glide speed and surface setting. (This I never heard of from any of the experts in Europe.)

About your bounce which really is the thing I am after now.— I believe we could call it wind riding. As the model turns into the wind it rises, and at this point it must roll into a downwind turn. It is something I never had with my other models. I will add a little stab tilt to my rubber job to see if I can get it gliding like the A-2. I believe the secret is to have a force built into the ship which will not decrease as airspeed decreases. A bottom rudder is effective but on my glider I needed some stab tilt to get the roll.

August 26, 1957

Throw everything away that I sent you as I have now got it all squared away with this summer flying, and if you put out a book I can send an article on Towline Trim and new rule Wakefield setups. It is too long a story to tell now. Except to say that in dead air 100% C.G. is tops and in windy air you cannot beat your bounce set-up.

To illustrate, last Saturday we flew Wakefield Eliminations. Ed Mazam was flying a 50% C.G. bounce set-up, and I was flying a 100% C.G. set-up Bilgri told me about at the Nationals. I made 2.21, 3:00, 3:00 during first three rounds. Mazam made 1:31, 1:36 flying during same period. Then the wind picked up and I made 1:39 and 1:30. Mazam made 3:00, 3:00 and 3:00, and beat me by 30 secs. The same thing happened to me in A-2 at the Nationals. During morning I made 1:40 and 1:35, then the wind picked up and I made 3:00, 3:00 and lost the ship. (Bounce set-up.) At the A-2 trials I was not using tail tilt and tight circle and got badly beaten by a JASCO Nordic with three breaks—high dihedral wing with tight turn and bounce.

Anyway, it makes me feel gool to solve this wind problem. As Stuart Savage said in your last book, it had me disgusted.

The whole thing would make an interesting article—but it is sad that I am now flying your old glider set-up, and the English Wakefield set-up after 18 years of contest flying and research. But that is what makes the game so interesting.

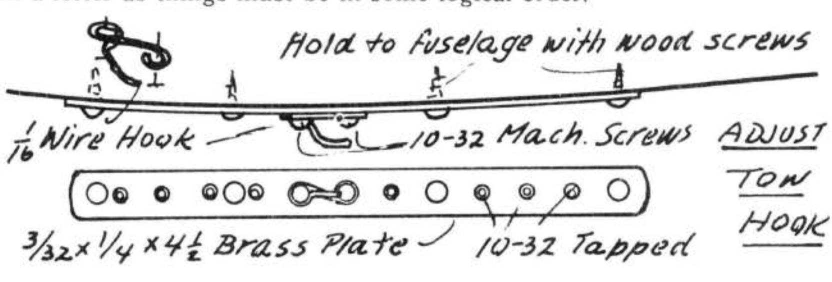
I take my bounce glider out in late evening air and it looks like a sick duck. The same goes for my Wakefield set-up. Give them some wind and they look like the World's best adjusted ships. The 100% C.G. jobs at night are out of this world—when the wind blows they look like dead ducks.

The answer—simply a dual set-up on one model—100% C.G. for calm dead days—50% C.G. for windy and gusty air.—This would be a hot machine. Say you are flying at trials and the first two rounds are calm with light risers; set the wing at 100%. Then the wind picks up for the last three rounds; switch to 60%

We have no tow problems as they were licked by tow hook couple and high incidence set-up. I can pull the model overhead without a waver. If it veers I simply pull harder and it comes right around. You cannot do this with tow hook under C.G. I guarantee you. I can even fly it overhead and down in front of me before release.

As to inertia drag in wind off line; I simply do a vertical stall, and with tail tilt, it snaps into clean turn. When I make my last flight at the Nationals it looped at top and never stopped climbing.

Well, that's enough for the time. Its hard to give you all the dope in a letter as things must be in some logical order.



REPORT ON 50 gm. WAKEFIELD

by Carl Hermes —— Arlington, Tex.

I am enclosing plans for my 50 gram Wakefield which I hope you will be able o decipher. The ship is a joy to fly and capable, I believe, of fairly high performance. While the ship of course does not climb as high as 80 gram jobs, it is definitely superior in thermal riding ability. The low moment of inertia is very evident as it boobs around very much like a H.L. glider in a weak thermal. Maximums are the rule. In fact, on a normal thermal day in summer (or any time of the year in Texas!) I believe the 50 gram ships will hold their own against 80 grams. This was also true we found of 80 grams vs. unlimited rubber.

The big prop works well on 12 strands so I cannot see any point in reducing it. 14 strands seem to yield the same altitude in about 37 seconds. The adjustments, Right-Left, seem to take full advantage of the big prop's helicoptering action. The ship climbs straight up until just before the stall and then veers off to the right. The result looks very similar to the normal spiral. I do not believe the model would obtain same altitude with Right and associated downthrust.

Geodetic is a lot of work—I think I will stick to conventional structure.

The fuselage was an experiment that worked. The strength provided by double tissue and light quarter grain is fantastic. The fancy wing mount is a lot of work that could best be done away with. A constant rectangular cross section would do just as well. — I cannot say enough for Fran Heeb's prop shaft. The lack of cussing required to bend it is the big thing.

The sheet fuselage on the Wakefield is made as follows:

1. Cut two sides out of light quarter grain 1/16th (Sig's)
2. Cement hard 1/16th square around the outline.
3. Cover inside with tissue with grain VERTICAL. Two coats of dope.
4. Cut out top and bottom and cover inside the same way.
5. Assemble and cover outside.

1/16 plywood nose bulkhead is very important towards holding this thing to ether when it hits straight down.

April 27, 1957

You ask about why we were not so consistant with unlimited rubber. I am not sure, but I know I can speak for myself.

I feel the secret was in maintaining a zero slack condition—taut motors. I can recall that the only ships I ever heard or knew of that showed consistent good performance were the gear jobs. Sooner or later every one had to find that out. It is impossible to wind an "untaut" motor and maintain a constant C.G. True, there is a technique where-most of the time the unavoidable bunching is fairly well distributed. I found that it is possible to develop this technique in your garage and have it completely escape you at Cranfield with a half a dozen people lined up on each side talking while you wind. It is all summed up very nicely by Ed Lidgard in his article on rubber which was written for the Wakefield Handbook of 1953. I would heartedly recommend your reprinting that in the new year book.

When you stop to think of the effect the C.G. shift of a 6 oz. motor would have on a 9 oz. airplane it becomes more apparent. We all knew about it but seemed to blunder on hoping that fate would be kind. I personally was afraid of gears, or just too lazy to build a set.

Torque is no real problem, Frank. The Right-Left flight pattern make it ridiculously simple. Even with Right-Right most of the ships seem to hold the nose down under the first burst. This is probably due to long tail moment we have come to accept.

I mentioned in the last letter that the 50 gram ship is a joy to fly. This is due to the ease with which you can wind. No matter how you stretch or come-in, the result seems always to be the same. This, of course, means that less skill is required which is another argument that I would just as soon avoid.

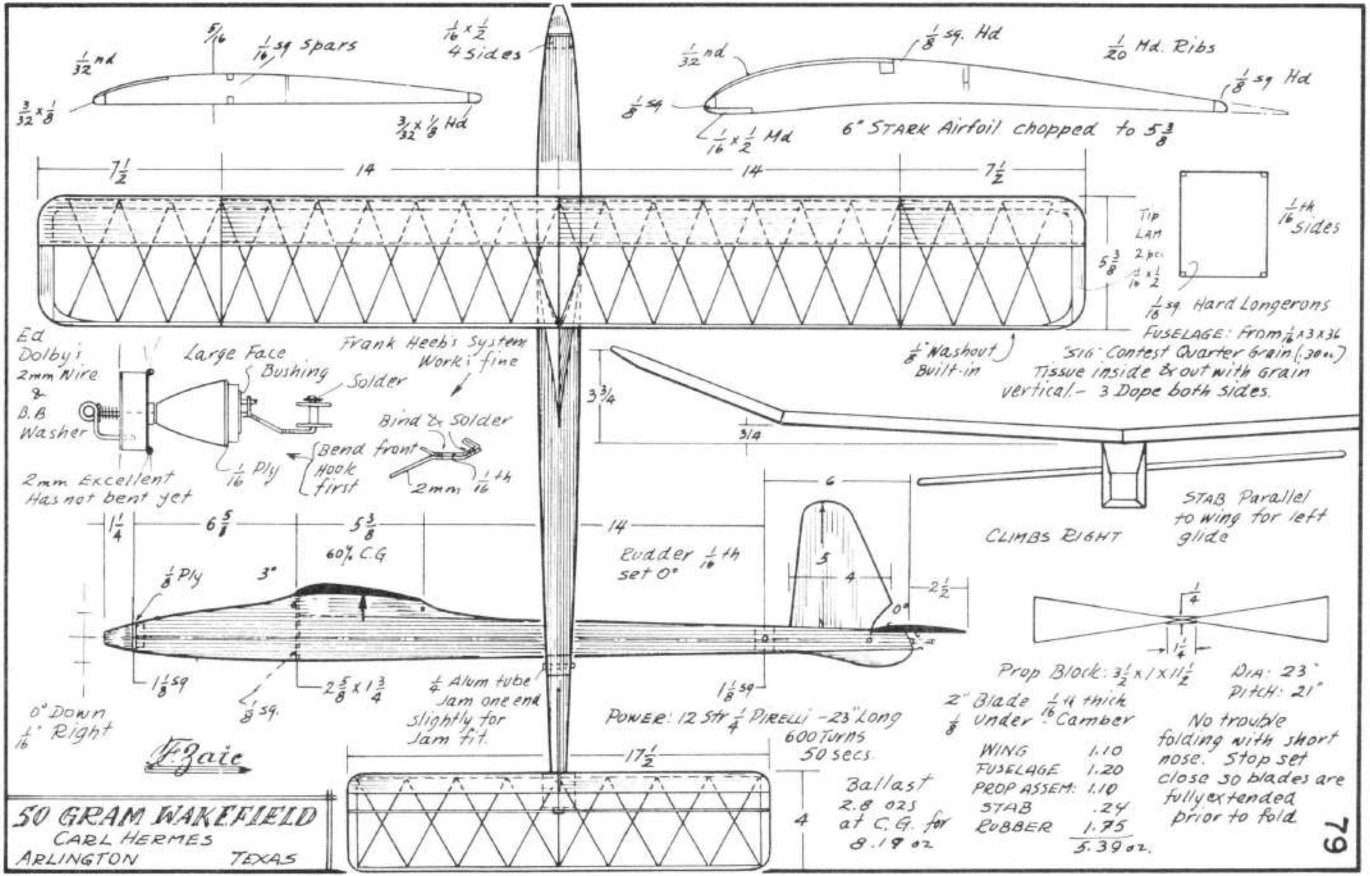
May 28, 1957

How the time flies! Had the Nordic eliminations last Sunday and I WAS. I just did not have my heart in it this year somehow. I started to build a new ship but never got around to finishing it. Last week with a slight burst of enthusiasm I patched up last year's ships but they just were not good enough. Herb Kothe's wife Pat surprised us all by getting the best time. Herb and Norm Ingersoll also placed.

After watching all the gliders I have come to the few conclusions, most of which echo your comments in your last letter.

The "European" type of glider does not necessarily produce the best result in our weather. The thin airfoils seem to stall easily when entering or leaving thermals. Even worse, after they stall, they seem to loose more altitude recovering than the "American" jobs. Herb built a 7 foot beauty this year with MVA 123 type section which would do an honest 2m 25 s in calm air. He used the identical force arrangement as on his old ship (1955-56 Year Book) but its gust riding ability were nowhere near as good. Pat Kothe was flying a squared off version to beat him out of top place. Stuart Savage expressed about the same idea in the 1955-56 book.

Herb's old ship is at its best riding bumpy air close to the ground. I have seen the thing do 3 minutes, 2½ of which was 50 feet off the ground. This is where a lot of the thin airfoil "2½ min. dead air" gliders seem to fall apart.


50 GRAM WAKEFIELD
CARL HERMES
ARLINGTON TEXAS
F. Zaic
1/32 rnd
5/16
1/16 sq Spars
3/32 x 1/8
3/32 x 1/8 Hd
1/16 x 1/2
4 sides
1/32 rnd
1/8 sq. Hd
1/20 Md. Ribs
1/8 sq Hd
1/8 sq
1/16 x 1/2 Md
6" STARK Airfoil chopped to 5 3/8
7 1/2
14
14
7 1/2
Tip LAM 2 pcs 1/16 x 1/2
5 3/8
1/16 th sides
1/16 sq Hard Longerons
FUSELAGE: From 1/16 x 3 x 36 "516" Contest Quarter Grain (.30 oz)
Tissue inside & out with grain vertical. - 3 Dope both sides.
1/8" Washout Built-in
Ed Dolby's 2mm Wire & B.B Washer
Large Face Bushing
Solder
Frank Heeb's System Works fine
Bind & Solder
Bend front Hook first
2mm
1/16 th
1/16 Ply
2mm Excellent Has not bent yet
3 3/4
3/4
1 1/4
6 5/8
5 3/8
60% C.G
14
6
1/8 Ply
3°
Rudder 1/16 th set 0°
5
4
2 1/2
0°
CLIMBS RIGHT
STAB Parallel to wing for left glide
1/4
1 1/4
1 1/8 sq
1/8 sq.
2 5/8 x 1 3/4
1/4 Alum tube Jam one end slightly for Jam fit.
1 1/8 sq
0° Down 1/16" Right
Prop Block: 3 1/2 x 1 x 11 1/2
DIA: 23"
PITCH: 21"
2" Blade 1/8 under
1/16 th thick Camber
POWER: 12 Str 1/4 PIRELLI - 23" Long
600 Turns
50 secs.
17 1/2
4
Ballast 2.8 ozs at C.G. for 8.19 oz
WING 1.10
FUSELAGE 1.20
PROP ASSEM: 1.10
STAB .24
RUBBER 1.75
5.39 oz.
No trouble folding with short nose. Stop set close so blades are fully extended prior to fold

The problem is to place on the team under American strong thermal conditions and then built new ships capable of performing well on the continent. I was surprised to see Mr. Semenzato do as well as he did with my ships in Italy last year.

When anyone tells me they are seriously considering Nordic for the first time, I always recommend Herb's ship in the 1955-56 book. Squaring of the tips makes it simple and does not seem to effect performance.

AIRFOILS FOR WAKEFIELDS by Barry V. Haisman

Yes, the Cheeseman sections are very popular around Montreal, especially on Nordics. Re the pointed LE 'foils as used on the Amazoom. I have followed the theorists, including Suzuki, as far as possible, but my own conclusions on practical experience are fairly cut-and-tried, and I find that most modellers back me up.

(1) They are no good for Wakefields, even with undercamber, demonstrating a vicious stall and lacking the "tolerance" needed for this class model. Still air trim can be as good as other sections, but still air trim doesn't guarantee contest succes.

(2) On F.A.I. Gas it's a different story. If you want maximum altitude you require maximum velocity, and blunt-entry, undercambered airfoils are not the ultimate. With the entry right down to the base line the mean camber line is still reasonable on the flat-type section, so that there is enough CP travel to keep trim off the edge of the cliff. As far as glide is concerned we believe this to be an over-rated factor, for the model should climb so high in 15 secs. that a difference of point this or that per foot difference in sinking speed should be utterly irrelevant This doesn't mean that contemporary Montreal gas models are climbing out of sight in 15 secs.—but the boys are working on it. Rate of climb is all—even recovery from power to glide should not be a great source of worry. Get altitude, then relax. The pointed, flat-bottomed section seems to help.

The worst section I've ever had on a Wakefield was one I tried last year. It was like Stark's, only a bit thinner. Sometimes it would, sometimes it wouldn't; there was no "build-up" to the best trim, indeed it would fly much the same on widely different settings of CG and longitudonal dihedral. It was extremely unreliable. Frequently, I'd get a beautiful climb, and the model would do two wide, lazy glide circles, feathering prop ticking over slowly, and then for no reason (and even in flat calm) would get into a stall and swoop and lurch down to the ground with no sign of recovery anywhere. Having tried everything, I was convinced it was the lousy wing section. So last Sunday, in an attempt to prove that any wing was better than this one I took the model out with an old flat-bottomed wing, some 12% thick, and somewhat rashly put it up in a snowstorm and bumpy air. I had a new model, evident even on low hand turns and not much height. Longitudinal stability was excellent, and while I shall build another wing for this ship I feel that I have proved that Stark's section is for Stark. (It's very like Grant X-9).

I have come to the conclusion, after twenty Wakefields and twenty years of model flying, that provided a Wakefield section follows certain general requirements it doesn't much matter if it's any particular section or even if it is drawn very accurately:

(1) It should have fair thickness, 10% or more—a Wakefield wing needs to get some "bite" on the air (may be because it flies so slowly)

(2) Maximum camber height should be located around 35-40% from the LE

(3) The entry should be rounded, though not blunt, at 4-5% above a tangent to the bottom surface

(4) Excessive undercamber is no asset—much more important is the T.E. droop of around 6-8 degrees.

In general, thin and pointed sections appear to be murder. There's a whole flock of sections meeting the requirements listed—RAF 32, NACA 6412, Joukowski, Davis, Eiffel 400, Cheeseman etc.

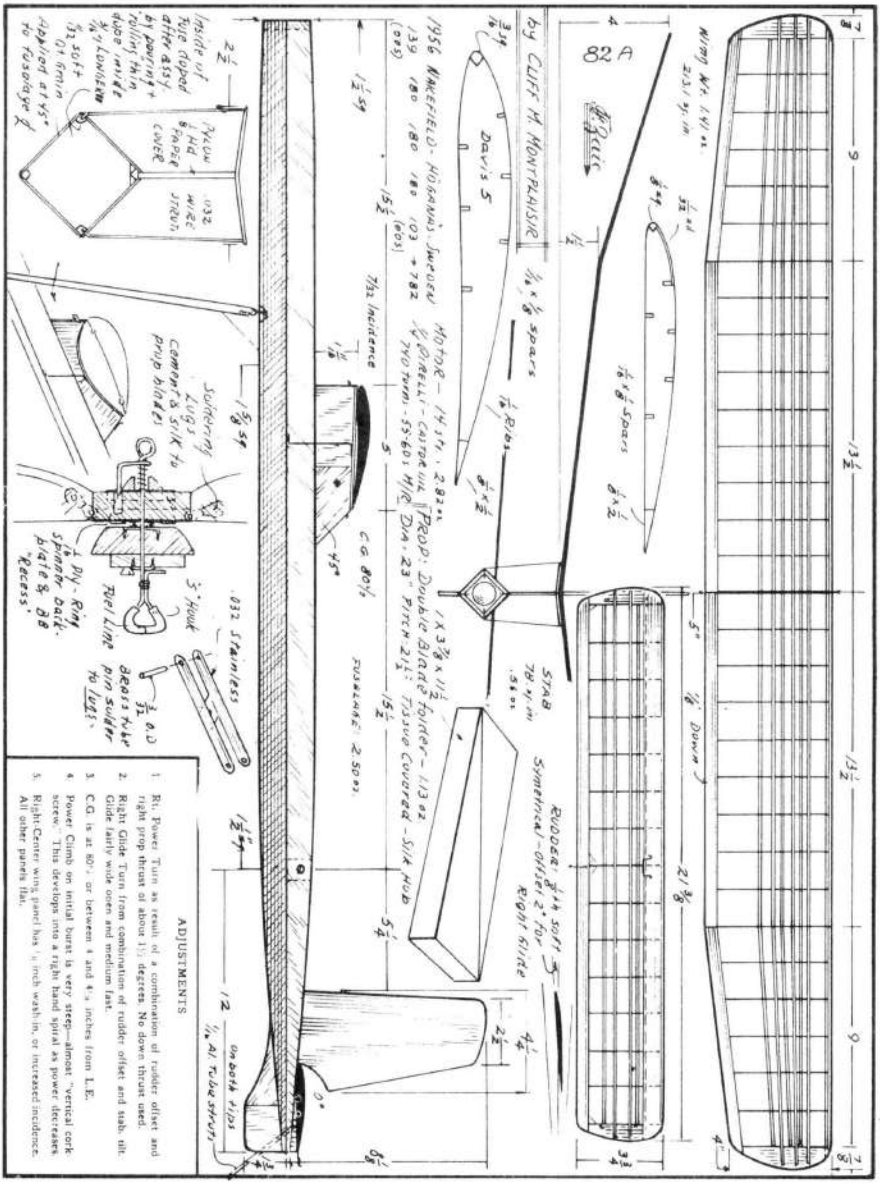
What is no good for Wakefield, however, appears to be good for gas, probably due to the lower skin friction coefficients and the higher Reynolds Numbers gas models operate at. The gas model, moreover, has a higher power/weight ratio plus greater longitudinal stability which, allied to the former conditions, reduces the need for a "tolerant" section with large CP travel. (Please excuse my private jargon!) Incidentally, harking back to gas model sections aimed at helping climb to the exclusion of all else I have often wondered if John Lenderman ('53 Book) did any more work with bi-convex airfoils. With engines even better than they were then, it could be that John had something that would pay off in 1957. I am thinking in terms of an F.A.I size ship with an Oliver Tiger. . . . No?

Here is another Montreal bulletin, the section on Segrave's Wake being in my opinion just about perfect for this class of model. He made preliminary flight tests with this ship last Sunday and is quite excited about glide performance and general stability. Incidentally, you are welcome to use any material in these bulletins, although I'm not implying that anything of earth-shattering consequence has appeared lately—or at all. Have you ever featured a featherer in the books? I can't recall one. I believe it's the answer for rubber—freewheeler type climb, no transition problems, and folder quality glide.

DEVELOPMENT OF A WAKEFIELD FLIER

by Cliff M. Montplaisir ——————————West Chester, Pa.

Enclosed are a number of sketches of my 1956 Wakefield Arne Blomgren did an outstanding job of proxy flying it at the Finals last year at Hoganas, Sweden. He couldn't have done better than the three maxes and 2 00S's he put in under the conditions prevailing, and I wouldn't have done as good myself, I'm sure.



This 1956 design is an outgrowth of the geared job I built in early 1954 to meet the 80 gram rubber rule. You have it in your 1955-56 year book, you'll remember. Wing and stab are identical with exception of no tip plates on the stab. Use of minimum cross-section fuselage including a mere sheet pylon was retained altho fuse. was lengthened to take single skein 14 strand motor. The thin pylon seems to contribute towards stability under power burst, but the bugaboo here is the inherent weakness of the set-up. A streamlined strut on either side—from platform to side fuselage longerons—adds considerable strength but looks rather primitive.

The version of this design I qualified with in 1956 (in a 6th round fly-off) used on a single bladed folder (22½ in. D-21½ in. P) but later tests on the second ship showed a 2 bladed 23 in. dia., 21½ in pitch prop as quite superior. Ten to 15 seconds was added to the motor run and more altitude was gained. Blomgren flew this one model thru the five rounds at Hoganas and held my qualifying ship as a spare.

Of course circumstances prevented the U. S. teams from competing in person in 1956 but, considering everything, the International Team Committee has done a terrific job in recent years in getting money and/or sponsorship for the Teams. I should know, as their hard work put me overseas twice (1952 and 1953 Wakefield Finals) to compete in person. To them I owe a debt of gratitude for a wealth of experience gained on these FAI trips. I only hope that my efforts have justified their toil. Other fellows who have made these trips feel the same way. We have all made lifetime friends from other countries—engineers, professional men, production workers, farmers, students—all interesting people with a universal interest, the modeling hobby. Frank, you know many of the same fellows I do by cirtue of your own trips and you can attest to their genuine and wholesome competitive spirit. It is invigorating to be in contact with these known experts and to feel that, in a small way, you are one of them.

Sometime ago you asked me how I got started on this Wakefield craze. That reminds me of what my wife once said. It went something like this, "Now that you've got an obsession, Clifford, when are you going to get a hobby?" Well, there is no real answer to that one, I suppose, but I will admit as I grow older and have more job responsibility and the two boys need more attention, that the obsession is actually taking a back seat to the hobby.

O.K., back to your question. It all started in the summer of 1951 when I was transferred to Richmond, Va. There I met an interesting and talented modeller, and a Wakefield Team member of 1950, Austin Leftwich. Between flying periods, most of our bull sessions that year were on developing a consistant four minute Wakefield. We wanted no more than that, if possible, just a four minute average. The "long jobs" were starting to make news and to me (not to Austin) they showed definite promise. The West Coast boys had carried them all the way to the 1951 Finals but unexpected turbulent air had upset their true potential. I wanted the potency of a long job in calm air, but with the ability to take the wind if the occasion arose Getting ahead of my story slightly, I was ultimately able to do this by having two separate and distinct stab incidence and thrust adjustments—one for calm and one for wind—a method worked out after innumerable tests in all kinds of weather.

Anyway, my enthusiasm in these ideas at the time led to a beer bet with Leftwich to the effect that I could or could not build a four-minute Wakefield. Up to that time I had built a number of rubber jobs including a few kitted "Flying Cloud" Wakefields with varying degrees of success.

The rest is history. The original ship was designed and built with painstaking care and even then necessitated several drastic changes before the final version emerged. The final design used a high aspect ratio wing (14:1) and the almost flat-bottomed Davis airfoil which was made famous in World War II on the B-24 Bomber. As a matter of interest, all my Wakefields since have employed this same section. I have found it extremely stable under all conditions and not in the least bit fussy on adjustments such as is displayed by some of the cambered airfoils. Then, after swapping out a single bladed folder for a twin blader, I was in business.

A long series of tests began in March and soon proved that the ship was not only consistant, but definitely a four minute plus model. I suppose about 4:45 average could have been gotten out of it in "dead air." Test flights at Langley Field, Va. really had the boys take notice.

The ship survived a very gusty Eliminations to qualify for the East Coast Semi-Finals, where it placed second to gain a berth on the last 6-man Wakefield Team Imagine, on and off-chance bets I had put myself on a plane bound for Norkoping, Sweden, site of the 1952 Finals.

Our Team didn't do too well that year with only two of us in the top ten, Joe Bilgri and myself. Better days were bound to come.

I qualified on the 1953 Team with the same model, but flew one of those high-powered geared jobs at the Finals at Cranfield, England. That year we were lucky enough to win all the prizes. Joe Foster, the Wakefield Cup in a thrilling three man fly-off finish, and our Team the F.N.A. Team Trophy. The gas boys took their events too, so the trip was very worthwhile.

Then come more rule changes to eliminate the 6 oz. rubber—3 oz. airframe jobs. Only 80 grams of rubber made for some head scratching to get the most out of this limited power, but the fellows came thru and pretty soon it was a cinch to get the new three minute max every time

The most recent rule changes by the FAI Model Commission have the worlds contest fliers screaming loud and long. As one wag put it, we can now interchange 50 gram motors for wing bands between flights on our Wakefields. With the proposed by-annual rules for the FAI events, I will miss the yearly Spring rush to get the models completed, rubber motors broken in, testing madly on weekends, etc. I will also miss the excitement trying for the team every year and the chance to meet old friends. It's an unfortunate and unwarranted rule change and maddening enough to drive one to drink.

Well, anyway, that was a good idea and now I feel quite contented as I sit here trying to finish this letter to you, dismissing models from my mind momentarily, and sort of half listening to the radio and sipping a double Martini. I only wish you were here to join me in one, Frank, but since you are not, the least I can do is toast your health and happiness, so time out while I bend my elbow to you.

I also took time out to mix another Martini and while I was out in the kitchen I thought I migh as well drink it out there and mix another one to bring in here to save getting up again to go mix another out there and in so doing I feel I'm beginning to fell pretty hih. It's funny how a cold dring can warm up your stomahc and inspire your thoughts inn't? I must be gettign tired writing for I startew feel a littel dizzy so i muxed another Martini and now my head fels a clear as a bell agin/ O o youcan)t beat the combnation of good gin vermouth and stiffed o olview, beer an squoth and bourban are alrighr but you canot beet gin ermouth with even pockeld onoions.

Now i like a littet dring now andthen and i hove take a courth or moybe afiftf and I am more than evew convincdess that any man shqe doesn't is stupif and not inth pref½rspirit of the season O i could drinh martonees alday and never quibber an elelash an soso sworse a citizeh than Ias vefore. This country is good as it evew wax. wd al know taxes are hightm, but still we are well of f in Usa. THERE ujts inn't a better countrty.

Say tese Marunis is all righr, when wev neded stimulanys we sure do evenin if some people don(t like it who are bluncoses and its a pretty kinf of kettle fish if i cant drinj a toatst to old frenz I i coudl drong matrinis by the quat to yourr haellh all night and still bass anu so sobrity ets socheres again to your healtj..—*hpy Nw Yere?

Afectnantly yurous/

cl½he Montplqizir

PERFORMANCE OF RUBBER POWERED MODELS

by John Booker —————————— England

I first bcame interested in the old question of the relative merits of a fast climb or a long cruise in '55 and attempted a solution. The flight of a rubber model is complicated by varying torque, thrust and trim, so, to make an analysis possible I assumed a steady thrust throughout the power run and the same trim throughout power and glide. Then by equating the work done during the climb with the energy stored in the rubber motor I deduced equations for height and duration as follows:

$$H = \frac{\eta e R}{W\left(1 + \frac{1}{L/D \tan\theta}\right)}$$

$$D = \frac{\eta e R \left(\frac{1}{\sin\theta\sqrt{\cos\theta}} + L/D\right)}{V\,W\left(1 + \frac{1}{L/D \tan\theta}\right)}$$

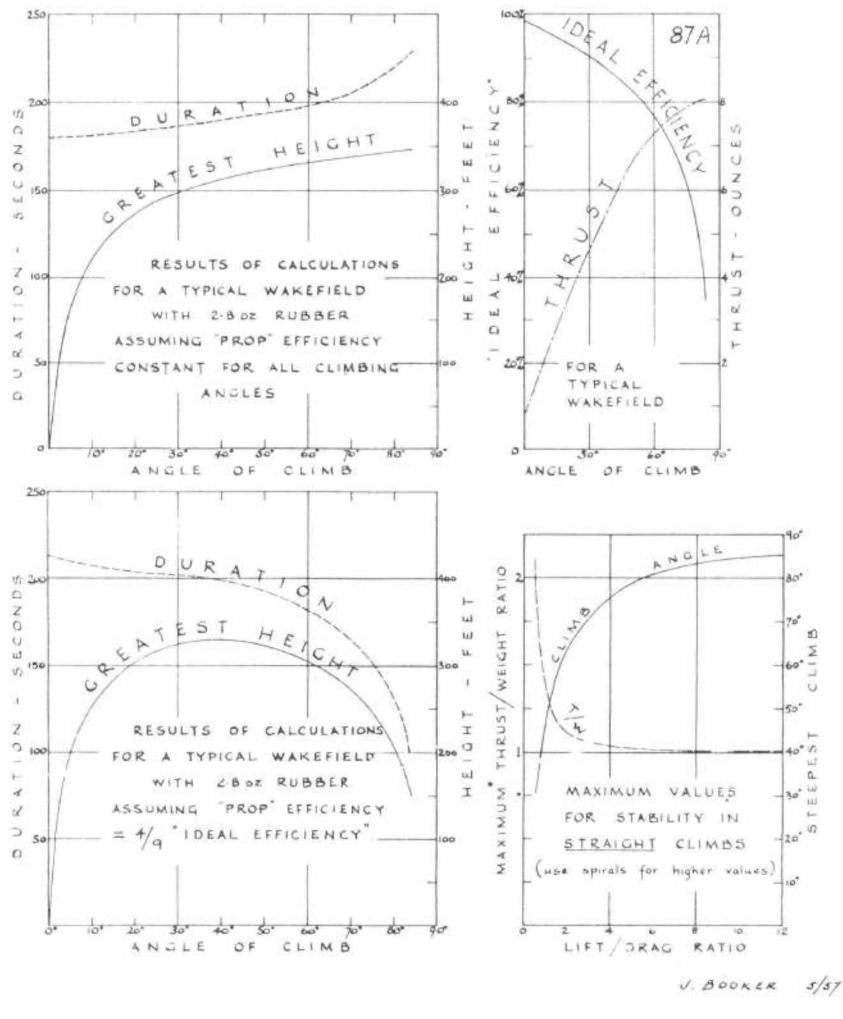
H = height in feet
D = duration in secs.
η = prop. efficiency
e = ft. oz. energy per oz. rub
R = weight of rubber
W = all up weight of plane
V = glide speed
θ = angle of climb

We notice from this that both height and duration depend upon the propeller efficiency η and the amount of energy stored in the rubber. Maximum height needs a trim for best glide or $\frac{Cl}{Cd}$ max. whilst longest duration needs a trim for lowest sinking speed or $\frac{Cl^{3/2}}{Cd}$ max. In practise both of these will probably occur at the greatest angle of attack at which the plane can be trimmed without showing that "nodding" motion which heralds "Dynamic Instability" and often builds up to a stall. Because of "Dynamic Stability," improving a model's L/D ratio makes it more difficult to fly and it usually has to fly faster to remain stable. This cancels out part of the benefit of the better L/D ratio.

Increasing the quantity of rubber will result in a greater height being reached but the flying speed will increase also. In open contests we find that progressively adding rubber to the lightest possible airframe increases height and duration but the increase becomes less and less until finally when the rubber weighs twice as much as the airframe the duration begins to decrease although the height still increases. Under the old Wakefield rules the lightest possible airframe made up to 8 oz. with rubber would give the greatest duration.

A typical Wakefield was imagined having a good glide of 1 in 10, flying speed 19½ ft./sec. which gives a sinking speed of 1.95 ft./sec. during glide. I reckoned on 2,700 ft./oz. energy stored per oz. of rubber and 35 per cent propeller efficiency, then I plotted graphs to see what happened when 'the model was flown with different motor runs giving different angles of climb. These showed that we got both the greatest height and the longest duration with a slow helicopter-like climb at the steepest angle at which the plane could be flown. This was 84 degrees with a thrust of 8.04 oz. You will notice this agrees with Alan Brown's article in the 1956 Yearbook.

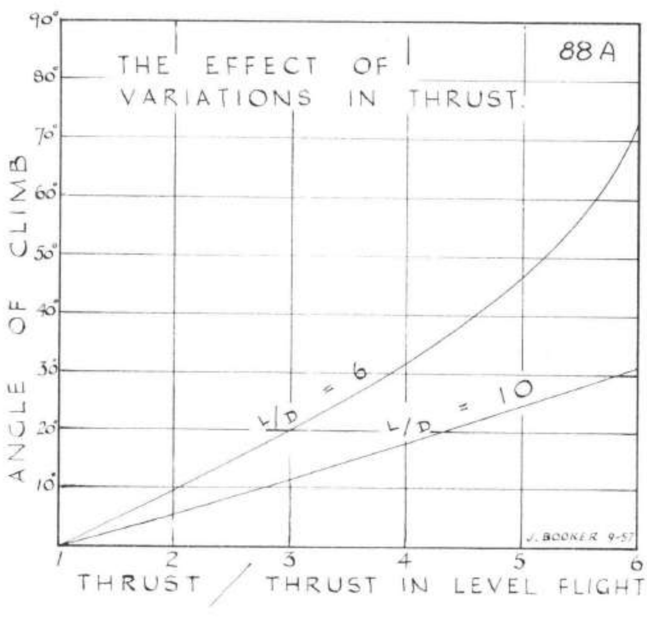
However I felt dissatisfied with this so I looked at our plane again and then decided to alter one point. I had taken the propeller efficiency as being constant at 35 per cent. Now no one has ever measured the efficiency of a Wakefield propeller in flight so far as I know, but we can calculate what is called the "Ideal Efficiency." So I did this and then took the practical efficiency as 4/9 of the "Ideal Efficiency." If I were doing it again I would take the efficiency as 80 per cent of the Ideal Efficiency and the energy in the motor as 60 per cent of the maximum.



Plotting the graphs again using these new values for efficiency we get a very different story and one which seems to me to be more likely. The greatest duration is in level flight with longest motor run. This agrees with indoor practice and Dick Baxter's ideas. We get the greatest height with a 40 degree climb at the expense of a little duration. The slow helicopter climb comes nowhere with normal size propellers, because in order to obtain the necessary high thrust with a slow speed we must waste a lot of power in the slipstream.

The varying torque will produce a varying thrust and also affect the efficiency of the propeller. It seems that the torque at full turns is about three times as much as at the beginning of the cruise which itself is about twice the end of cruise value. Obviously a climb at a steady angle is not possible under these conditions but the best plan would seem to be to arrange our power in a fairly long run so that the plane is flying level at the end of the cruise. The high initial thrust can be absorbed during take-off, even if the motor-run is short, but if the plane is arranged for maximum climb with short motor-run it would almost certainly loop if hand-launched.

A long cruise type of model with a good L/D ratio will not be affected much by the high thrust at the beginning of its motor run, but if it has a low L/D ratio it will climb steeply at first instead of having a gentle climb. So a high L/D ratio is desirable for a long motor run model. Differences in L/D ratio do not show up much with steep climbing models because the thrust is hauling the model up and the drag is reltaively unimportant. A nose-down trim will be needed at the beginning no matter what the L/D ratio if a short fast climb is used.

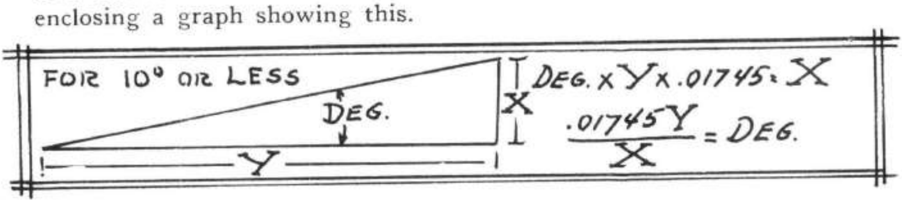


Downthrust is not in itself a waste of power as many people believe. In fact for an average model with 3 degrees downthrust the loss of power is only ½ per cent. But, as Geoff Woodcock, an old "Wakefield" flier, has pointed out to me, running the prop. shaft out of line with the rubber does result in loss of power due to friction and tends to cause oscillations in the motor. Downthrust trims the plane to a lower angle of attack which results in a higher speed and usually, but not always, a worse L/D ratio. A rubber model in a steep climb will actually increase its height and duration if downthrust is added as the increased speed improves the efficiency of the propeller. The trim under power alters in two ways. Firstly the thrust makes a moment about the C.G., this is usually a nose-up moment which can be reduced by downthrust. Notice that this moment depends upon the thrust and its line of action, whilst the effectiveness of the downthrust depends upon the nose-length. Secondly if the stabilizer is set positive to the thrust-line the slipstream will give a nose-down moment. This effect will be most powerful when the airspeed is slow and the slipstream fast such as at take-off and in slow climbs. Thus a pylon gas job, with a high C.G. and a low thrust-line with downthrust, will be dangerous at take-off when it will easily dive in, but will tend to pull out of straight dives from a height as the speed builds up. This set up is ideal for Wakefields to counteract the looping tendency at take-off. Notice that this effect on the stabilizer is greatest with low "Ideal Efficiency."

To sum up then we want a light airframe, plenty of rubber, a big efficient propeller and then fly with a long motor-run. Our plane should have good stability and a high L/D ratio, high wing and low thrust-line, no downthrust but high angle of incidence on both wing and stabilizer to control the power.

I will have a go at explaining this stable climb business. If a plane has more thrust than it needs for the angle at which it is climbing it will speed up, and the increased lift will pull it into a steeper climb until the climb is steady again at a steeper angle with reduced lift and a slower speed.

The angle of climb equal to 90 degrees minus the gliding angle is the limiting angle of climb. If, when the plane reaches this angle of climb, it still has some excess thrust, it will loop. But obviously a model with a low L/D ratio needs more thrust than one with a high L/D, so it can be flown with more thrust but not in such a steep climb. I am enclosing a graph showing this.



DEVELOPMENT OF A WAKEFIELD MODEL

by Jerry Thomas ——————————————— Tacoma, Wash.

The Wakefield is fairly well proven by now as I have turned out five of the same design, and found the adjustments could be built-in and more or less fly it off the board.

This was helpful in "55" when I had two well adjusted models and was getting that last minute "to make sure" test flight in, and managed to lose one in the process. In three days I had to turn out a new body and tail and use an older, but similar, wing. I managed to get up to half winds in testing it the morning of the local elims when I had to give up to start my officials.

I lost my tested job on the 3rd flight. So I had to use the "quickie" for my 4th, comes what may. On full winds it went up like a jewel and because of high wind and lack of transportation it went cross country into the trees too. It got me 3rd in the elims with about 30 sec. behind 1st and 2nd with four flights.—I managed in the semi-finals to hit my usual California "downer" and so was just an "also ran."

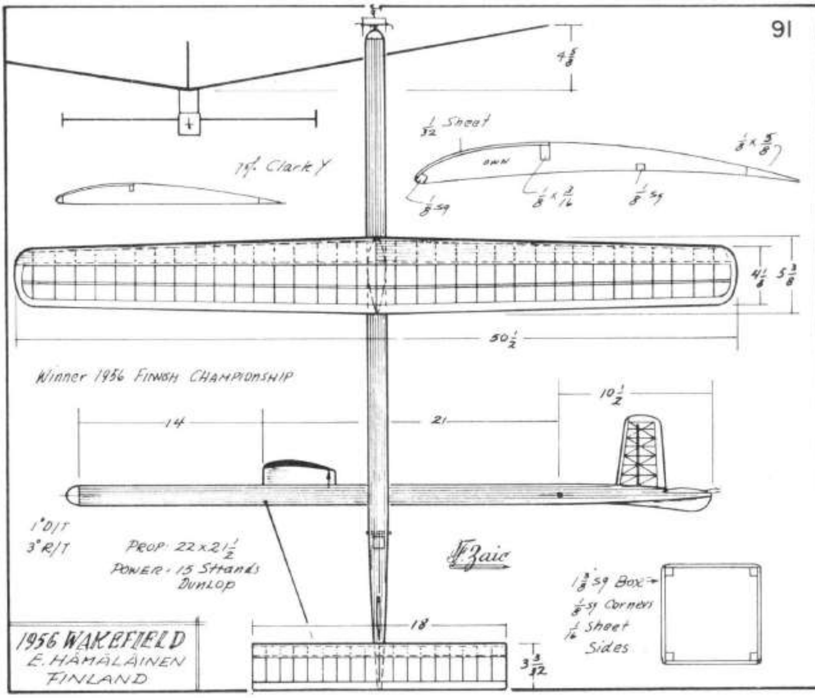
In this year's elims (1956) Gil Coughlin with copies of my job was 6 sec. behind Joe Bilgri when his D/T worked too soon on his 5th flight, and I was 14 sec. behind Gil for 3rd. Someday I may break my pattern of luck in California and get 5 flights without that "downer" stuck in.

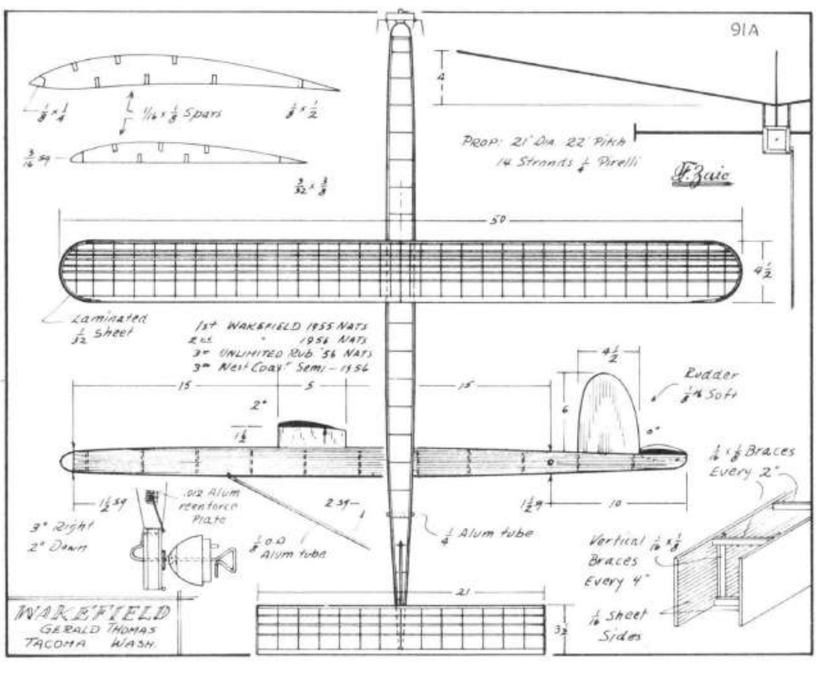
I wish we could have the Semi-finals up here (Tacoma) some day as our flights are either a nice average or an easy thermal, and not the "things" in California where, if you do not use more than 40 degrees pop-up tail, you are sure to lose it. P.S. Downdrafts are just as extreme.

On side note; the airfoil is a Grant foil from an article explaining why a Sharp L.E. is the thing for a model airfoil. It was first used by Syd Seldon from Tacoma who was on the 52 Team. After his success with it, I tried it and have used it ever since.

The sheet sides and regular cross braces are a combination of easy construction, lighter weight and ability to get "inside" easily to check for excess cement. With four sheet sides, you have to be too careful as to the choice of wood, and usually end up with too light a sheet to handle without extreme care. I would just as soon make two slides, which you handle most, half again as heavy and very easy to handle and put the savings into a stronger wing and prop.

The prop hinge is the type used by Foster. I added the reinforcing plates when the wire pulled loose in a blade. For "take-off" gear I use ⅛ inch Al tubing. Although soft, it is light and tough enough, and it is easy to install.—I borrowed Lidgard idea of tube in the nose to protect spring. After replacing prop shafts many times I started bending the winding loop as shown. It is 10 times easier to make and works very nicely.


91
7% Clark Y
1/32 Sheet
1/8 x 5/8
1/8 sq
1/8 x 3/16
1/8 sq
50 1/2
4 1/8
5 3/8
4 5/8
Winner 1956 Finnish Championship
14
21
10 1/2
1° D/T
3° R/T
Prop: 22 x 21 1/2
Power - 15 Strands Dunlop
F. Zaic
1 3/8 sq Box
1/8 sq Corners
1/16 Sheet Sides
18
3 3/32
1956 WAKEFIELD
E. HÄMÄLÄINEN
FINLAND


91A
1/8 x 1/4
1/16 x 1/8 Spars
1/8 x 1/2
3/16 sq
3/32 x 3/8
4
Prop: 21" Dia. 22" Pitch
14 Strands 1/4 Pirelli
F. Zaic
50
4 1/2
Laminated 1/32 Sheet
1st Wakefield 1955 Nats
2nd " 1956 Nats
3rd Unlimited Rub. '56 Nats
3rd West Coast Semi - 1956
15
5
15
4 1/2
6
Rudder 1/16 Soft
2"
1 1/2
1 1/2 sq
.012 Alum reenforce Plate
2 sq
1/8 O.D. Alum tube
1/4 Alum tube
1 1/2 sq
10
3° Right
2° Down
1/16 x 1/8 Braces Every 2"
Vertical 1/16 x 1/8 Braces Every 4"
1/16 Sheet Sides
21
3 1/2
WAKEFIELD
GERALD THOMAS
TACOMA WASH.

RUBBER POWER AND TURBULATORS

by Warren Gillespie, Jr. ——————————— Hampton, Va.

The articles in your 1955-56 Year Book entitled "Hi-Power Rubber Supply" and "Report on Some Rubber Tests" together with recent 50 grams rubber allowance for the Wakefield category have led me to consider this aspect of modelling in greater detail.

With respect to the use of surgical tubing as a source of power, I found it unsuitable for the following reasons:

1. Too expensive.

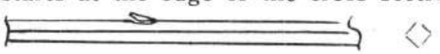
2. Maximum elongation is about 100% less than for Pirelli, although peak torque is much higher. This gives larger variation of torque to the prop, which is less efficient propwise.

3. The air must be allowed to escape from inside the tubing during winding. The best way to achieve this seems to be by a series of short slits cut lengthwise with a thin razor blade. Pin-hole pricks are inadequate and the pin-holes lead quickly to failure of the rubber, when winding to capacity.

4. Surgical rubber tubing tears more easily than Pirelli, since it contains little or no carbon filler which can act to strengthen and increase tear resistance.

Recently I have made some simple tension tests of small sizes of various bits of rubber. These included Pirelli, rubber from airplane shock cord, and rubber from my wife's hat band. Surprisingly enough, the hat band rubber had the greatest breaking strength, 2,460 lb./in^2, with shock cord at only 1,630 and Pirelli at 1,600. I suspect the shock cord rubber may have been below peak condition. Although Pirelli was low in strength it surpassed by a few percent the work capacity of the hat-band rubber, with maximum elongation of 675% for the Pirelli and only 600% for the hat-band rubber.

I found that in order to develop the breaking strength, it was necessary to avoid tying knots in the rubber. Failure of the rubber starts at the edge of the cross section, thus :



Any rubbing action rapidly causes failure by tearing of the rubber at a point of stress concentration. It would appear highly desirable to attempt to obtain rubber with a "round" cross section. I understand round rubber has been used by some European modellers at the last Wakefield contest.

Further, it would appear desirable to develop a model (Wakefield, of course) in which the rubber was in straight tension (now it is tensioned by being wound), for the following reasons:

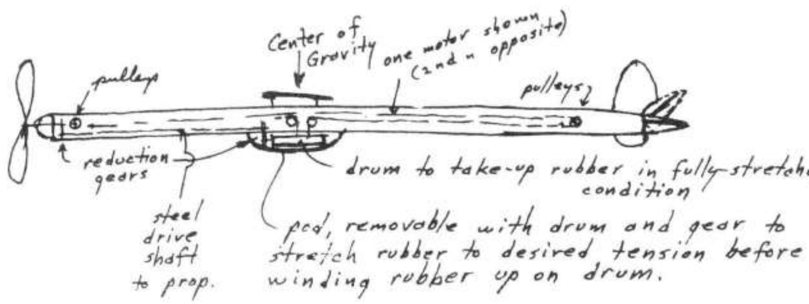
1. Less probability of motor damage.

2. More accurate control of energy storage (by using a spring-scale device.

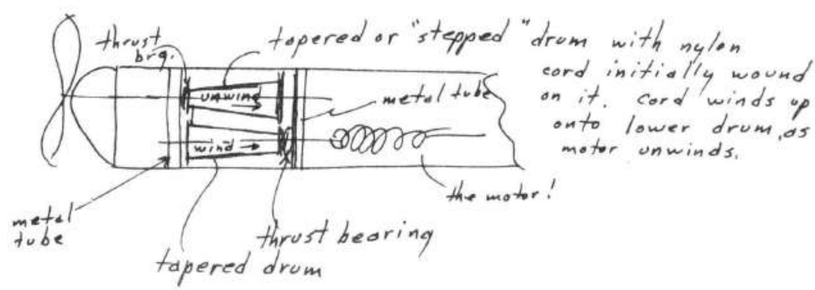
3. Phychological advantage over competition?

A calculation I made based on tension tests and wind-up tests indicated no great increase in favor of straight tension scheme; however, it is an intriguing possibility for the above mentioned reasons.

A tension-drive scheme that appears practicable is shown on the following sketch:



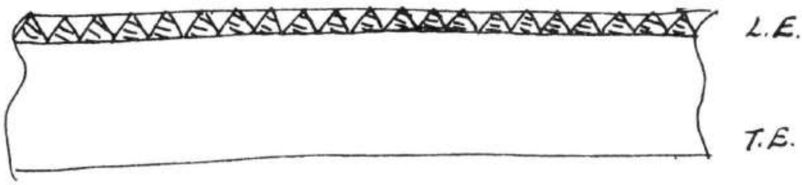
In either a tension-drive or the customary direct torque-drixe-model, the propeller will experience a considerable variation in driving torque. Since the propeller is basically most efficient at "one" operating speed (but what is it?) it might be desirable to reduce the initial torque or "power burst" and stretch out timewise and prop turnwise this initial unwinding or unloading of the rubber motor. For the direct torque drive we might use the following device:



A similar scheme could be incorporated in the tension drive ship by using a stepped drum.

As for the test concerning effect on rubber power using different strand sizes, about which Renaud wrote you, there seems little more to say. The torque output of a 16 strand 1/4 flat Pirelli motor is the same as a 64 strand 1/16 inch flat Pirelli motor of the same rubber. The smaller strand size is easier to tie and probably can be re-used more often. However, there will be more strands to tie.

Recently, Fred Pearce has run across (in some technical research literature) a unique type of wing turbulator device. This consists of pasting equilateral triangular patches on the top surface from the leading edge as follows:



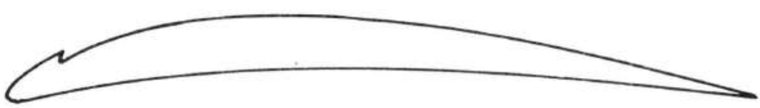
The patches should be somewhat ½ to ¾ inch for Wakefield or Nordic and 1/100 inch high approximately (we think). The idea is to break up the wave spilling over the patches to obtain a quick transition from a laminar to a turbulent flow. Unless this is done the boundary layer may still separate or transition to turbulent will occur further back from the leading edge. For the flow to become turbulent the two-dimensional wave front must break up into 3-dimensional horseshoe type of vortices. The saw-tooth arrangement of the patches is intended to assist this mechanism of transition. A preliminary flight test on Fred's Nordic indicated a much smoother glide in gusty air.

RUBBER POWER AND TURBULATORS

by Dick Baxter —— Lancaster, Calif.

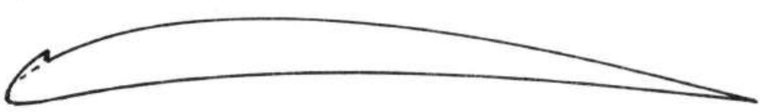
TURBULATORS

One more subject in which you might be interested: Turbulators. Henry Jex invented the "TV" or trapped vortex airfoil which he described in an article in "SOARING." The airfoil looked like this:



The vortex trap is supposed to work like this: Vortex or air rolling off sharp edged notch. Turbulence triggered by vortex trap.

My 1955 Wakefield had a vortex trap airfoil which looked like this.



Dashes show shape with Vortex Trap removed.

The model flew pretty well so I did not do any investigating. But after being eliminated from the team I decided to see what I had.

So, I removed the turbulator in steps of 1/4 Span at a time. Flying the model after each step. No noticeable trim change occurred. This I interpret to mean that the Vortex Trap did not appreciably effect the airflow over the wing. I have not flown the model enough since removal of the turbulator to tell whether performance has changed much, but I do not think it has.

If you print any of this, please state that I do not consider these experiences a conclusive test of the Trapped Vortex turbulator, and I only sent in the word so others will be encouraged to think about it.

While on this tangent, here's two more cents for cheap and dirty airfoil experimenters. It seems to me that any small effect is going to be very hard for a model builder to detect. Especially considering that most use no equipment except the open air and their two eyes. So I suggest this technique which I use. (So far with practically no positive results.) To determine whether a turbulator has any effect:

1. I trim the model to fly well without the turbulator.

2. I add the turbulator in sections, first to one panel (starting at the center) and then the other.

3. I try to fly the model enough after each addition to tell whether anything significant has happened to the trim.

For example, with the turbulator on one wing but not on the other, the model's turn pattern should be affected. A device which reduces drag would let the effected wing go faster and the model would tend to turn away from the treated wing. A device which increased the drag would cause the model to turn toward the treated wing. A device which increased lift would raise the treated wing and cause the model to turn away. And so on and on.

With the whole wing being treated, the pitch trim would be effected. Most of the turbulators with which I have fiddled required that the wing incidence be increased 2 or 3 degrees to prevent the model from diving. This has not impressed me as being necessarily good.

Now I must admit this approach has disadvantages. They are: If a trim change does occur, how do you tell whether the turbulator is better or worse than the untreated wing, or that the required angle of attack for best trim has not changed for the turbulator wing. (It probably has.) I cannot answer my own questions. All I can say is if no change occurs at all, you will at least know that. The turbulators which produce the biggest change should be either the best or the worst.

Fudo Takagi and I made some measurements of the Energy actually released by a rubber motor when unwound. Since I have always wanted to see such figures, maybe someone else is interested also—

1. Motors are wound in conventional fashion, except that instead of a fixed support the stationary end of the motor is attached to the torque meter "U" bracket.

2. When motor is wound—winder end is held in position so length between hooks is approximately equal to airplane motor base.

3. At max. turns, spring scale reading is taken and multiplied by torque meter moment arm (6 in. for my case) to get motor torque.

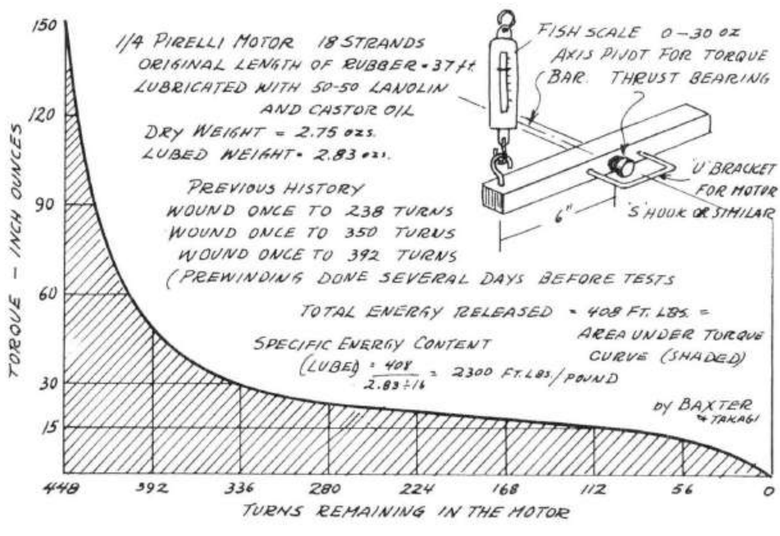
4. Motor is unwound 10 winder at a time and torque readings taken. This is repeated until the motor is unwound. Readings are made as fast as possible, resulting in an unwinding time of about 2 minutes. About similar to motor run of gear airplanes.

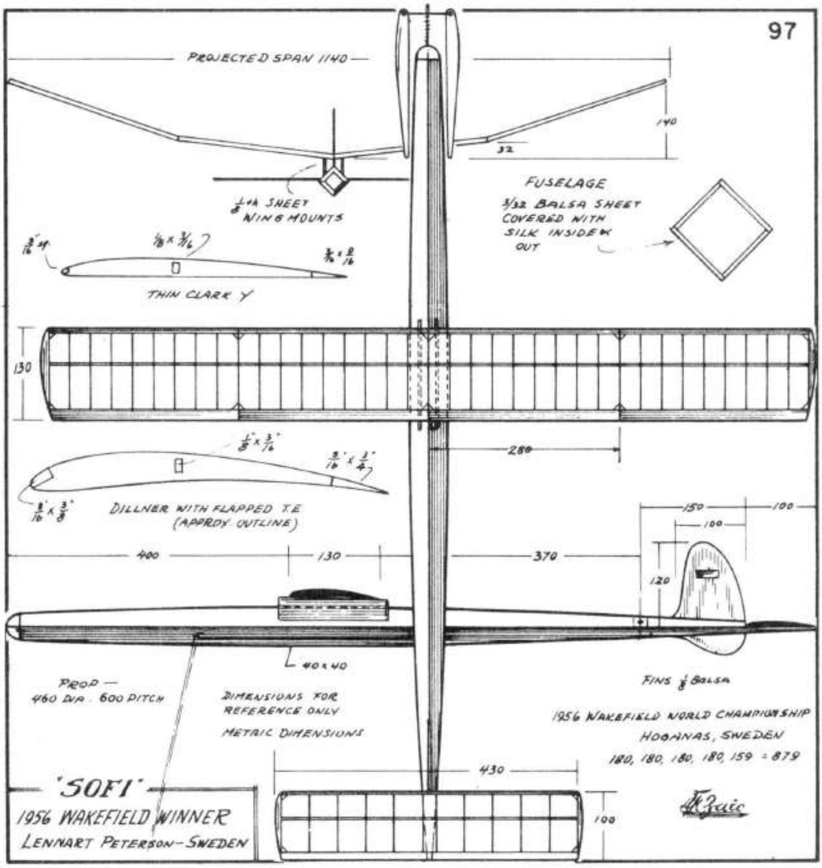
I have included a typical torque curve which I hope you will publish with the numbers on it. Nobody has ever done that since C.H. Grant quit.

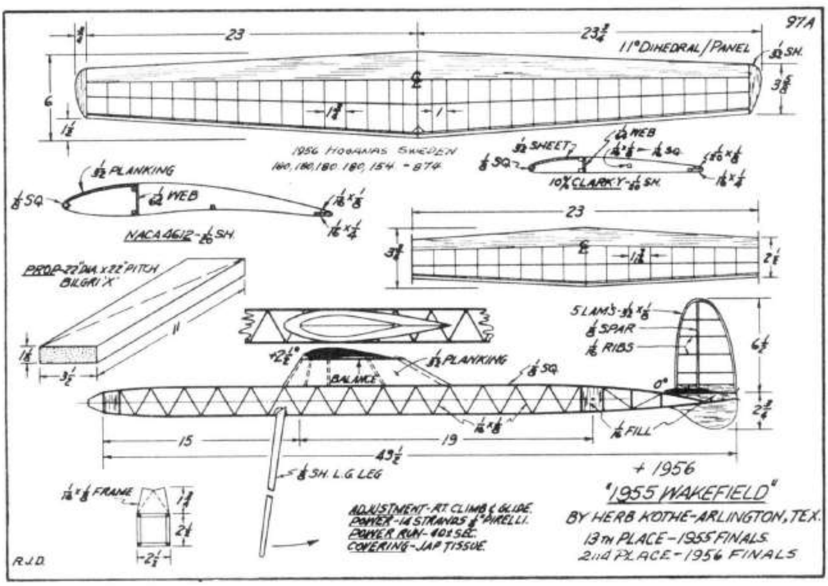
Unfortunately I cannot give you any information on other motor configurations than the one shown. I have had neither the time nor rubber to fiddle with any except motors I plan to use. Incidentally, I have taken to doing this to each motor as I prewind it as a quantitative check to weed out the No Good ones. Since the torque gadget is handy it only takes about three minutes extra per motor and is well worth the effort. Some interesting things about the particular motor are:

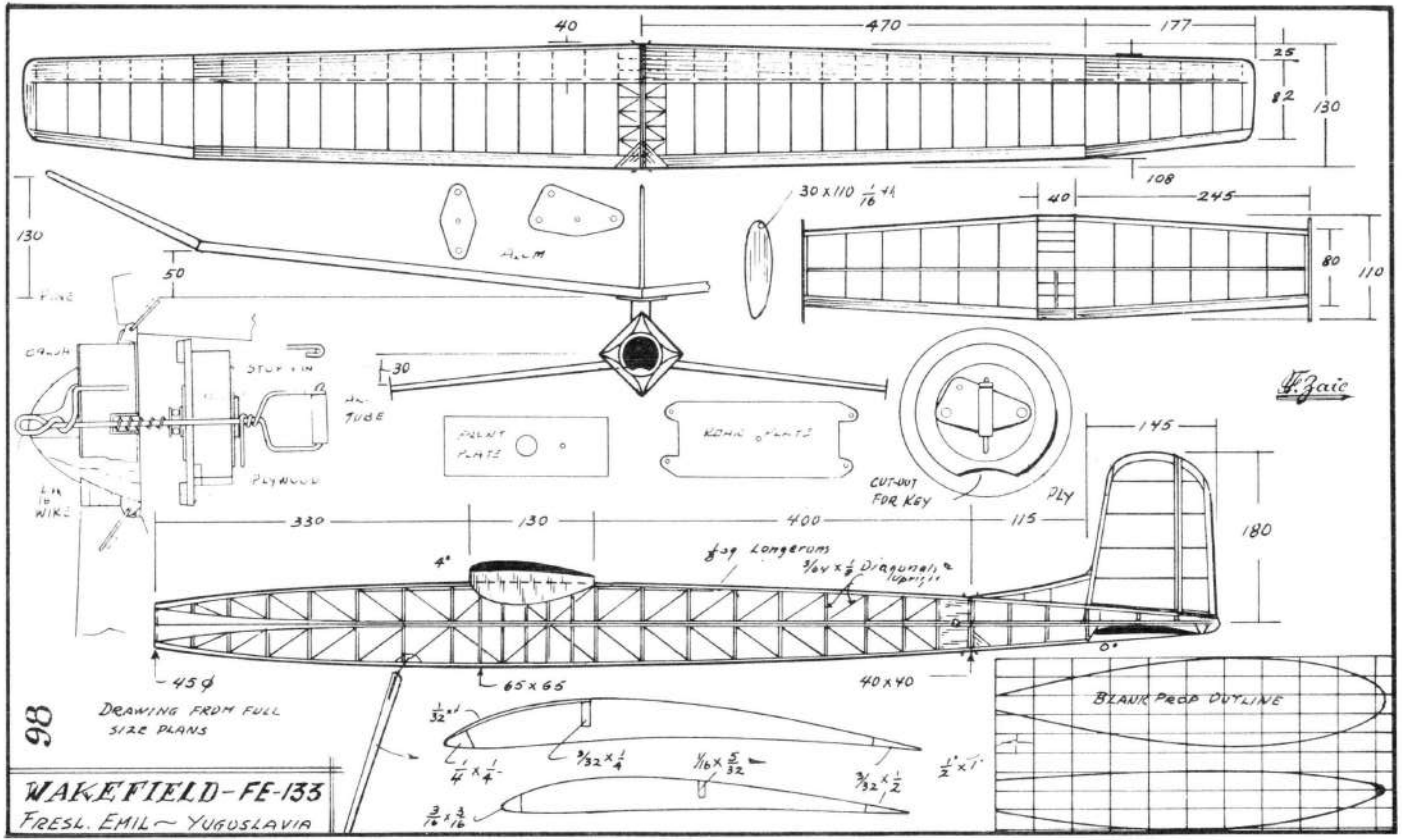
1. Specific Energy Content of similar (Pirelli) rubber measured by the pure tension method I used before was about 3000 ft. lbs./lbs. In a wound motor this is reduced to about 2300 ft. lbs./lbs. Therefore I am getting just under 80% of the rubber capacity to work in the motor.

2. Max. turns per inch for 18 strands of ¼ = 18 less than many tables show. Winding three times to this figure shreds the rubber.

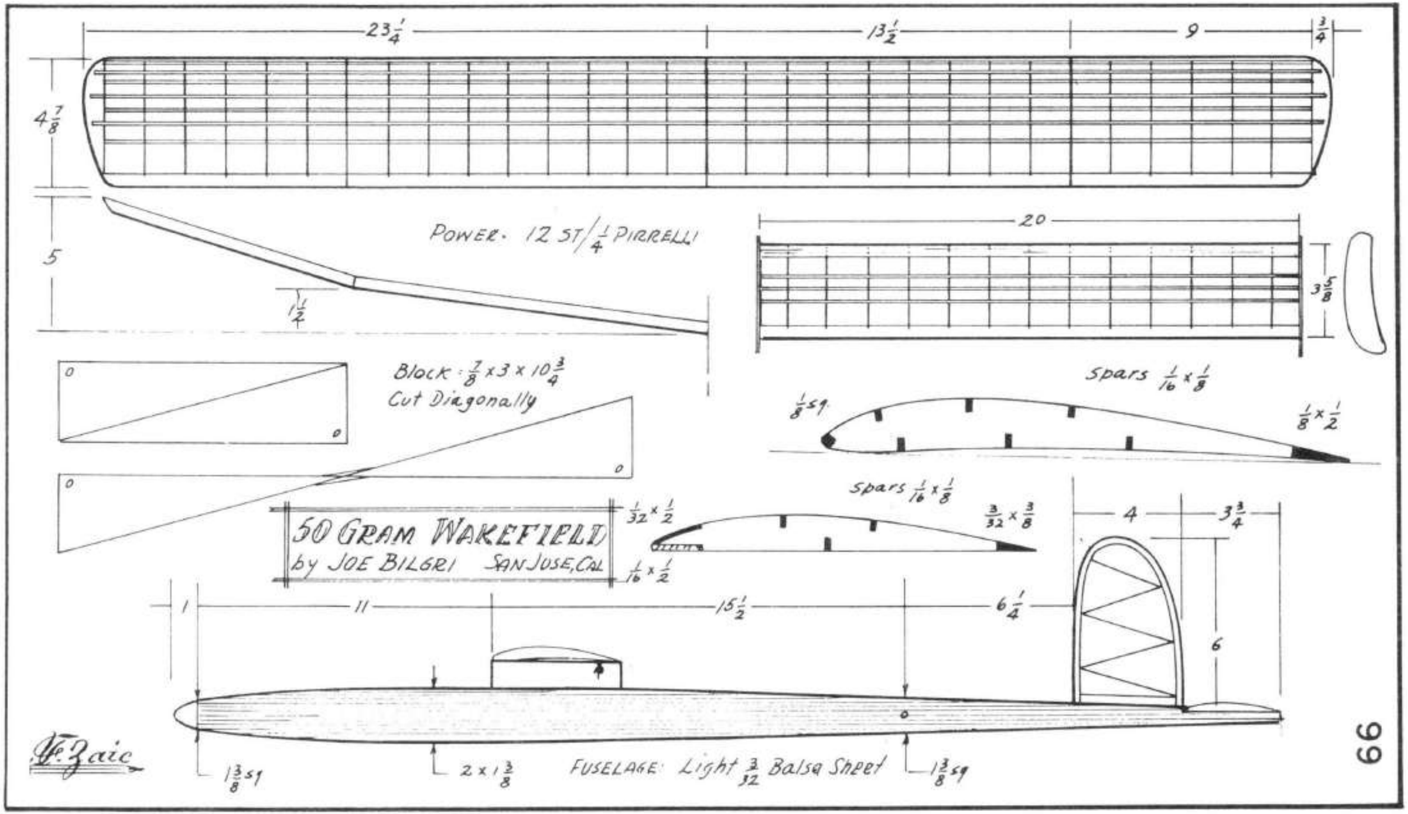


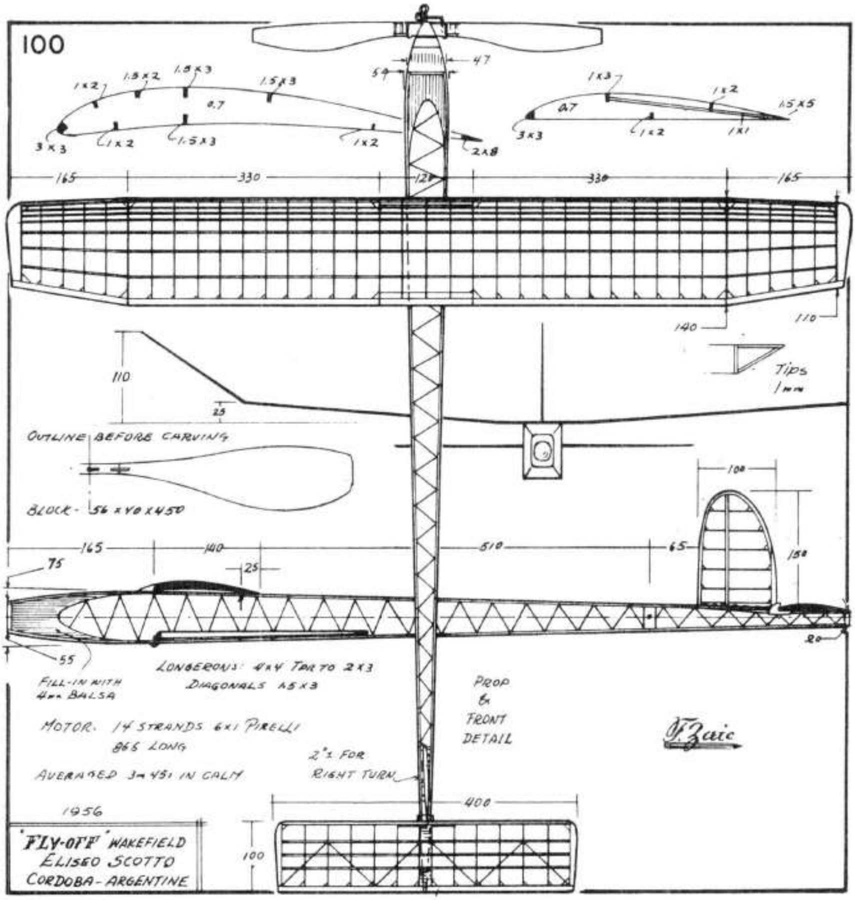

PROJECTED SPAN 1140
140
32
1/8 1/64 SHEET WING MOUNTS
FUSELAGE
3/32 BALSA SHEET COVERED WITH SILK INSIDE & OUT
THIN CLARK Y
130
280
DILLNER WITH FLAPPED T.E (APPROX. OUTLINE)
150
100
100
400
130
370
120
40 x 40
PROP — 460 DIA. 600 PITCH
DIMENSIONS FOR REFERENCE ONLY
METRIC DIMENSIONS
FINS 1/8 BALSA
1956 WAKEFIELD WORLD CHAMPIONSHIP
HOGANAS, SWEDEN
180, 180, 180, 180, 159 = 879
430
100
"SOFI"
1956 WAKEFIELD WINNER
LENNART PETERSON—SWEDEN

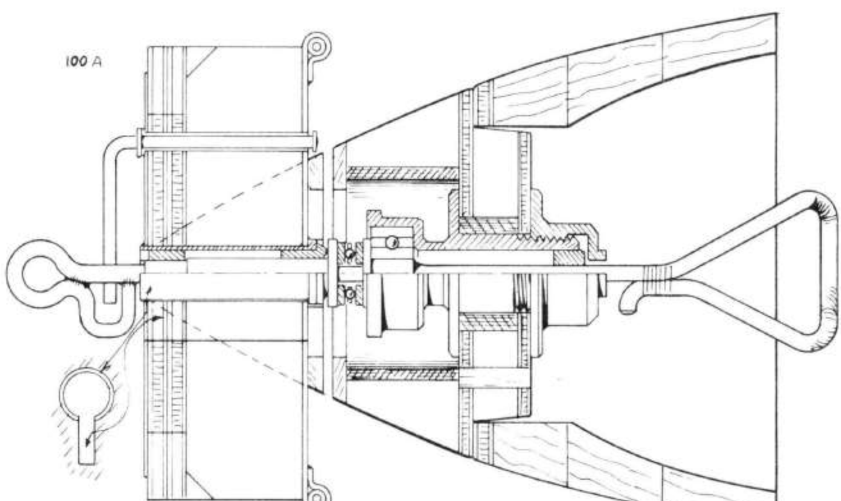

23
23 3/4
11° DIHEDRAL/PANEL
1/32 SH.
6
3 5/8
1956 HOGANAS SWEDEN
180, 180, 180, 180, 154 = 874
1/32 SHEET
1/64 WEB
1/8 SQ
10% CLARKY-1/20 SH.
1/32 PLANKING
1/64 WEB
NACA 4612-1/20 SH.
23
3 3/4
2 1/4
PROP-22" DIA. x 22" PITCH BILGRI 'X'
11
3 1/2
5 LAMS-1/32 x 1/8
1/8 SPAR
1/16 RIBS
6 1/2
+2 1/2°
1/32 PLANKING
BALANCE
1/8 SQ
0°
1/16 FILL
15
19
43 1/2
1/8 SH. L.G. LEG
1/16 x 1/8 FRAME
ADJUSTMENT-RT. CLIMB & GLIDE.
POWER-14 STRANDS 1/4" PIRELLI.
POWER RUN-40± SEC.
COVERING-JAP TISSUE.
+ 1956
"1955 WAKEFIELD"
BY HERB KOTHE-ARLINGTON, TEX.
13TH PLACE-1955 FINALS.
2ND PLACE-1956 FINALS
R.J.D.

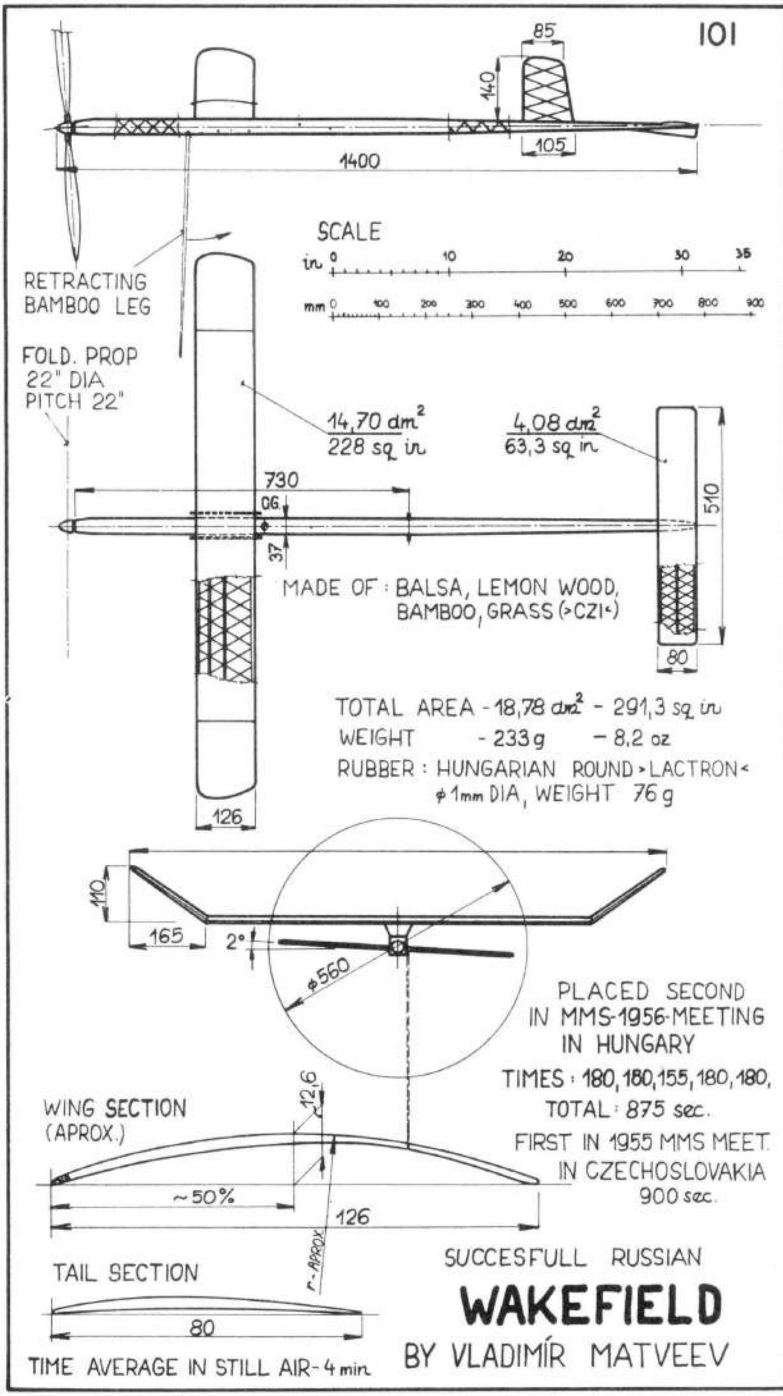


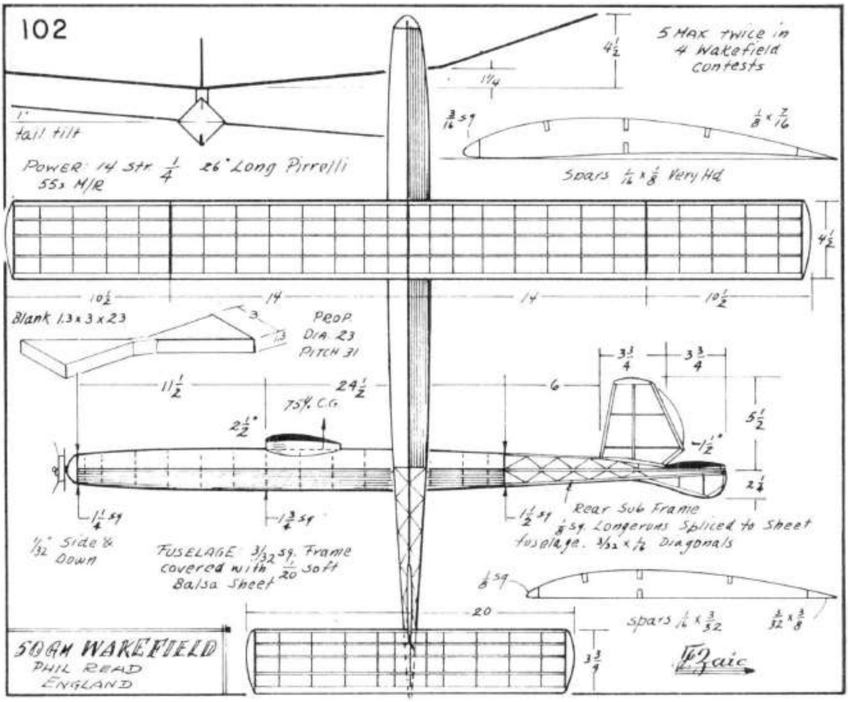
98
WAKEFIELD-FE-133
FRESL. EMIL ~ YUGOSLAVIA
DRAWING FROM FULL SIZE PLANS
40
470
177
25
82
130
108
30 x 110 1/16 + A
40
245
80
110
130
50
ALUM
30
TUBE
PLYWOOD
FRONT PLATE
CUT-OUT FOR KEY
PLY
145
180
330
130
400
115
4°
0°
1/8 sq Longerons
3/64 x 1/8 Diagonals & uprights
45 ϕ
65 x 65
40 x 40
1/32 x 1
1/4 x 1/4
3/32 x 1/4
1/16 x 5/32
3/32 x 1/2
3/16 x 3/16
1/2 x 1
BLANK PROP OUTLINE
F. Zaic

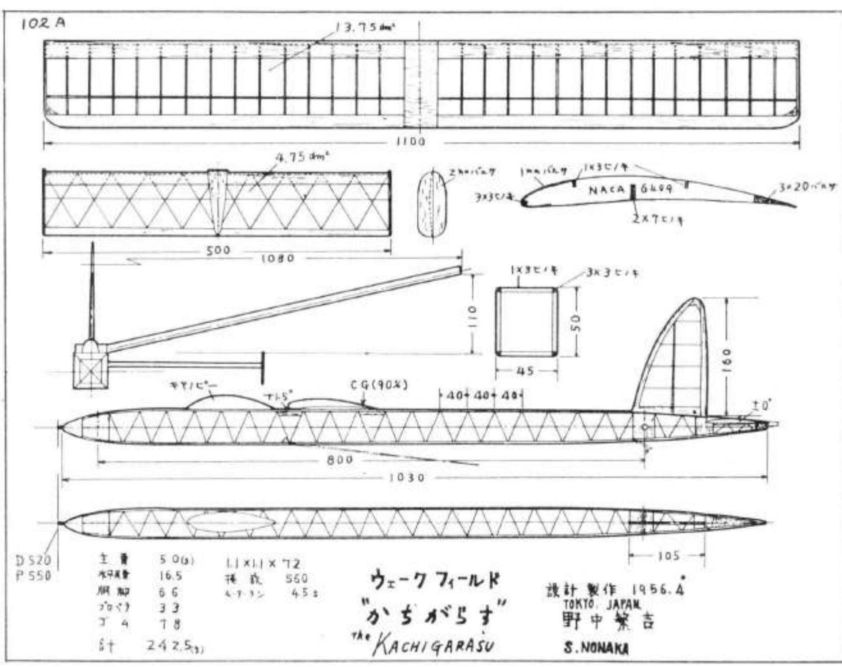

50 GRAM WAKEFIELD
by JOE BILGRI SAN JOSE, CAL
POWER. 12 ST/¼ PIRRELLI
Block: ⅞ x 3 x 10¾
Cut Diagonally
Spars 1/16 x ⅛
⅛ sq.
⅛ x ½
Spars 1/16 x ⅛
3/32 x ⅜
1/32 x ½
1/16 x ½
FUSELAGE: Light 3/32 Balsa Sheet
1⅜ sq
2 x 1⅜
1⅜ sq
23¼
13½
9
¾
4⅞
5
1½
20
3⅝
1
11
15½
6¼
4
3¾
6
F. Zaic

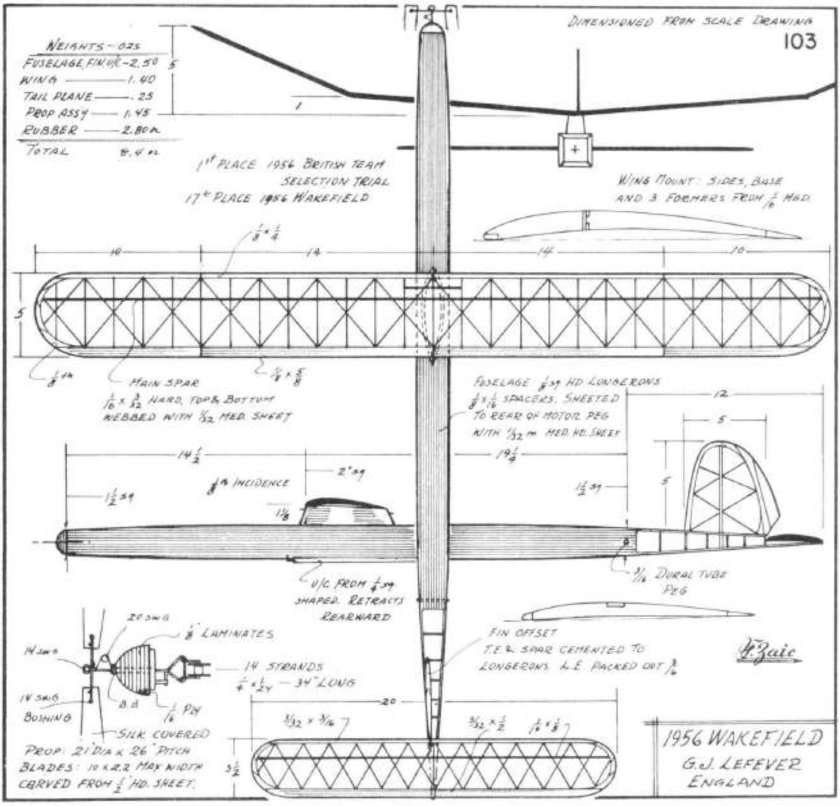

100
1×2
1.5×2
1.5×3
1.5×3
0.7
3×3
1×2
1.5×3
1×2
2×8
59
47
1×3
1×2
1.5×5
0.7
3×3
1×2
1×1
165
330
120
330
165
140
110
110
25
Tips 1mm
OUTLINE BEFORE CARVING
BLOCK - 56×40×450
100
150
165
140
510
65
25
75
55
20
FILL-IN WITH 4mm BALSA
LONGERONS: 4×4 TPR TO 2×3
DIAGONALS 1.5×3
PROP & FRONT DETAIL
MOTOR. 14 STRANDS 6×1 PIRELLI
865 LONG
2° FOR RIGHT TURN
AVERAGED 3m 45s IN CALM
1956
400
"FLY-OFF" WAKEFIELD
ELISEO SCOTTO
CORDOBA - ARGENTINE
100
F. Zaic

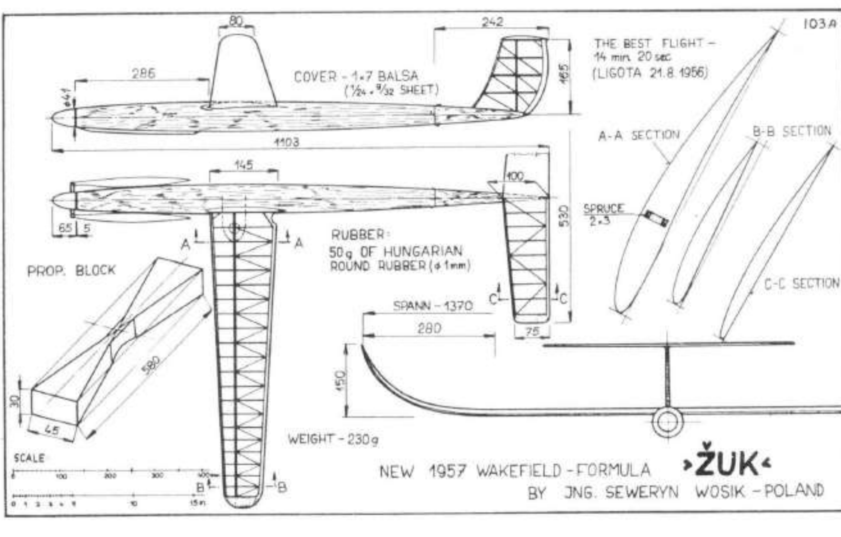

100 A

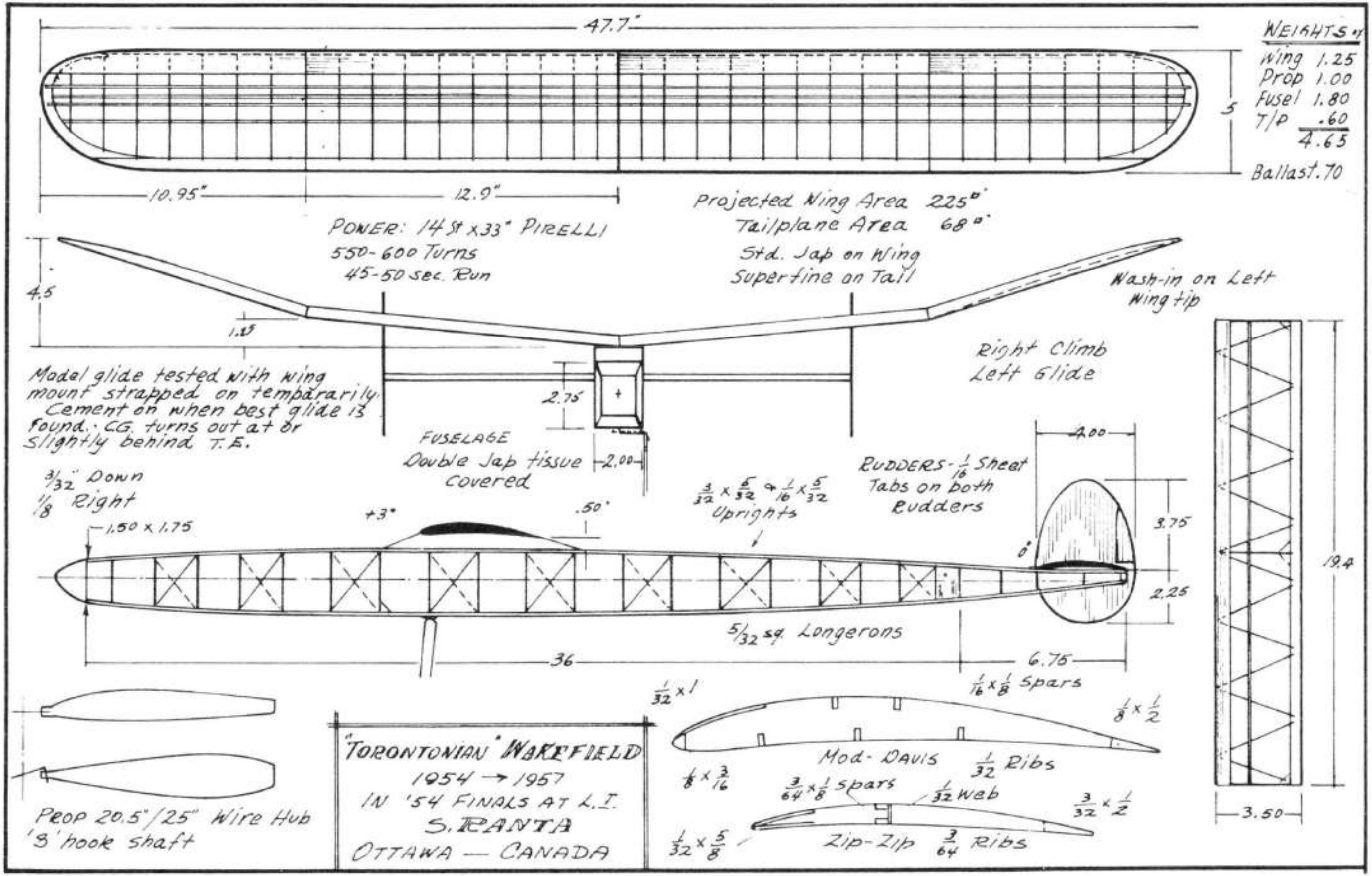

101
85
140
105
1400
SCALE
in 0 10 20 30 35
mm 0 100 200 300 400 500 600 700 800 900
RETRACTING
BAMBOO LEG
FOLD. PROP
22" DIA
PITCH 22"
14,70 dm²
228 sq in
4,08 dm²
63,3 sq in
730
CG.
37
510
MADE OF : BALSA, LEMON WOOD,
BAMBOO, GRASS (>CZI<)
80
TOTAL AREA - 18,78 dm² - 291,3 sq in
WEIGHT - 233 g - 8,2 oz
RUBBER : HUNGARIAN ROUND >LACTRON<
φ 1mm DIA, WEIGHT 76 g
126
110
165
2°
φ560
PLACED SECOND
IN MMS-1956-MEETING
IN HUNGARY
TIMES : 180, 180, 155, 180, 180,
TOTAL : 875 sec.
FIRST IN 1955 MMS MEET
IN CZECHOSLOVAKIA
900 sec.
WING SECTION
(APROX.)
12,6
~50%
126
r - APROX
TAIL SECTION
80
SUCCESFULL RUSSIAN
WAKEFIELD
BY VLADIMÍR MATVEEV
TIME AVERAGE IN STILL AIR - 4 min


102
5 MAX twice in 4 Wakefield contests
1° tail tilt
POWER 14 str. 1/4 26" Long Pirrelli 55s M/R
Spars 1/16 x 1/8 Very Hd
Blank 1.3 x 3 x 23
PROP. DIA. 23 PITCH 31
75% C.G.
Rear Sub Frame
1/8 sq. Longerons Spliced to Sheet fuselage. 3/32 x 1/8 Diagonals
1/32" Side & Down
FUSELAGE 3/32 sq. Frame covered with 1/20 soft Balsa Sheet
spars 1/16 x 3/32
50GM WAKEFIELD
PHIL READ
ENGLAND

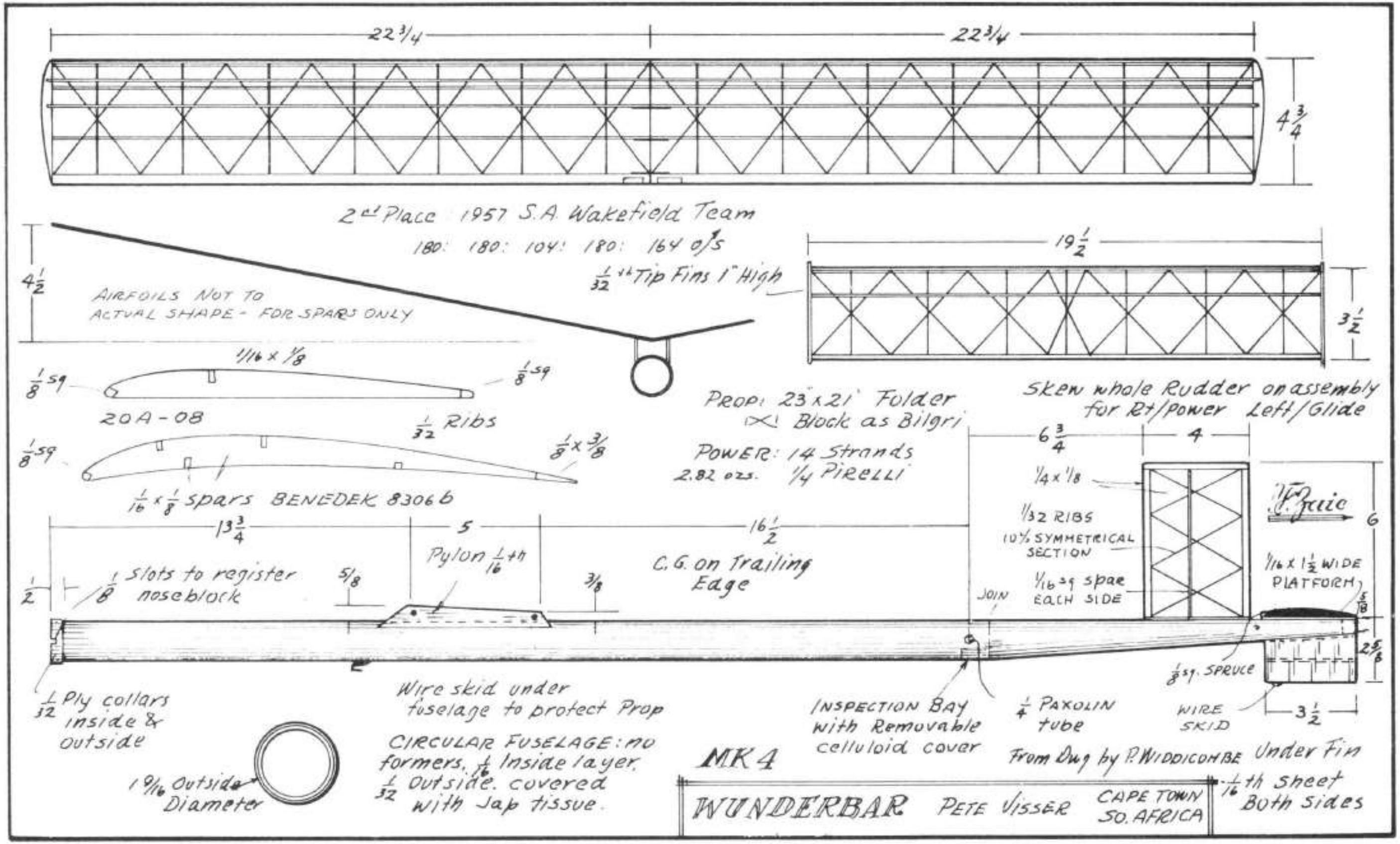

102 A
13.75 dm²
1100
4.75 dm²
NACA 6409
500
1080
CG (90%)
800
1030
105
D 520
P 550
ウェークフィールド
"かちがらす"
the KACHIGARASU
設計製作 1956.4
TOKYO, JAPAN
野中繁吉
S. NONAKA


DIMENSIONED FROM SCALE DRAWING
103
WEIGHTS - OZS
FUSELAGE, FIN, U/C - 2.50
WING - 1.40
TAIL PLANE - .25
PROP ASSY - 1.45
RUBBER - 2.80
TOTAL 8.4 oz
1st PLACE 1956 BRITISH TEAM SELECTION TRIAL
17th PLACE 1956 WAKEFIELD
WING MOUNT: SIDES, BASE AND 3 FORMERS FROM 1/16 MED.
MAIN SPAR
1/16 x 3/32 HARD, TOP & BOTTOM WEBBED WITH 1/32 MED. SHEET
FUSELAGE 1/8 sq HD LONGERONS 1/8 x 1/16 SPACERS. SHEETED TO REAR OF MOTOR PEG WITH 1/32 in MED. HD. SHEET
1/8° INCIDENCE
U/C FROM 1/8 sq SHAPED. RETRACTS REARWARD
3/16 DURAL TUBE PEG
20 SWG
1/8 LAMINATES
14 SWG
14 STRANDS 1/4 x 1/24 - 34" LONG
14 SWG BUSHING
B.B
1/16 PLY
SILK COVERED
FIN OFFSET T.E. & SPAR CEMENTED TO LONGERONS L.E. PACKED OUT 3/16
PROP: 21" DIA x 26" PITCH
BLADES: 10 x 2.2 MAX WIDTH CARVED FROM 1/2" HD. SHEET.
1956 WAKEFIELD
G.J. LEFEVER
ENGLAND
W. Zaic

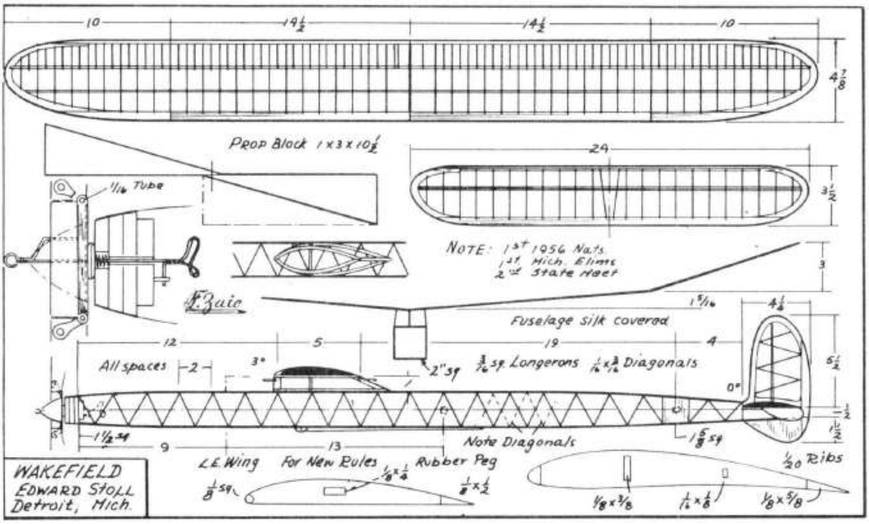

103A
THE BEST FLIGHT - 14 min. 20 sec (LIGOTA 21.8.1956)
COVER - 1x7 BALSA (1/24 x 9/32 SHEET)
A-A SECTION
B-B SECTION
C-C SECTION
SPRUCE 2x3
RUBBER: 50g OF HUNGARIAN ROUND RUBBER (ø 1mm)
PROP. BLOCK
SPANN - 1370
WEIGHT - 230g
SCALE
NEW 1957 WAKEFIELD - FORMULA
›ŽUK‹
BY JNG. SEWERYN WOSIK - POLAND



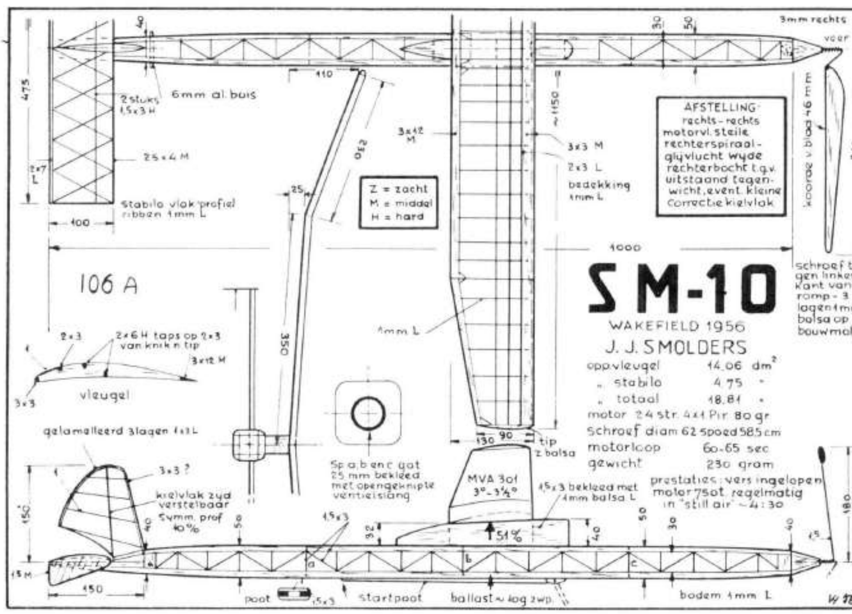
47.7"
WEIGHTS
Wing 1.25
Prop 1.00
Fusel 1.80
T/P .60
4.65
Ballast .70
5
10.95"
12.9"
Projected Wing Area 225□"
Tailplane Area 68□"
POWER: 14 St x 33" PIRELLI
550-600 Turns
45-50 sec. Run
Std. Jap on Wing
Superfine on Tail
Wash-in on Left Wing tip
4.5
1.25
Right Climb
Left Glide
Model glide tested with wing mount strapped on temparari1y. Cement on when best glide is found. CG. turns out at or slightly behind T.E.
2.75
FUSELAGE
Double Jap tissue Covered
2.00
4.00
RUDDERS-1/16 Sheet
Tabs on both Rudders
3/32" Down
1/8 Right
1.50 x 1.75
+3°
.50"
3/32 x 5/32 & 1/16 x 5/32 Uprights
3.75
2.25
19.4
5/32 sq. Longerons
36
6.75
1/16 x 1/8 Spars
1/32 x 1
1/8 x 1/2
Mod-DAVIS 1/32 Ribs
1/8 x 3/16
3/64 x 1/8 spars
1/32 web
3/32 x 1/2
1/32 x 5/8
Zip-Zip 3/64 Ribs
3.50
PROP 20.5"/25" Wire Hub
'S' hook shaft
"TORONTONIAN" WAKEFIELD
1954 → 1957
IN '54 FINALS AT L.I.
S. RANTA
OTTAWA — CANADA


22 3/4
22 3/4
4 3/4
2nd Place 1957 S.A. Wakefield Team
180: 180: 104: 180: 164 o/s
1/32 th Tip Fins 1" High
19 1/2
3 1/2
4 1/2
AIRFOILS NOT TO ACTUAL SHAPE - FOR SPARS ONLY
1/16 x 1/8
1/8 sq
1/8 sq
20A-08
1/32 Ribs
1/8 sq
1/8 x 3/8
1/16 x 1/8 spars BENEDEK 8306b
PROP: 23" x 21" Folder
Block as Bilgri
POWER: 14 Strands 1/4 PIRELLI
2.82 ozs.
Skew whole Rudder on assembly for Rt/Power Left/Glide
6 3/4
4
1/4 x 1/8
1/32 RIBS
10% SYMMETRICAL SECTION
1/16 sq spar EACH SIDE
6
1/16 x 1 1/2 WIDE PLATFORM
13 3/4
5
16 1/2
Pylon 1/16 th
C.G. on Trailing Edge
1/8 Slots to register noseblock
1/2
5/8
3/8
JOIN
5/8
2 5/8
1/8 sq. SPRUCE
1/32 Ply collars inside & outside
Wire skid under fuselage to protect Prop
INSPECTION BAY with Removable celluloid cover
1/4 PAXOLIN tube
WIRE SKID
3 1/2
CIRCULAR FUSELAGE: no formers. 1/16 Inside layer, 1/32 Outside. covered with Jap tissue.
1 9/16 Outside Diameter
MK 4
From Dwg by P. WIDDICOMBE
Under Fin 1/16 th sheet Both sides
WUNDERBAR PETE VISSER CAPE TOWN SO. AFRICA

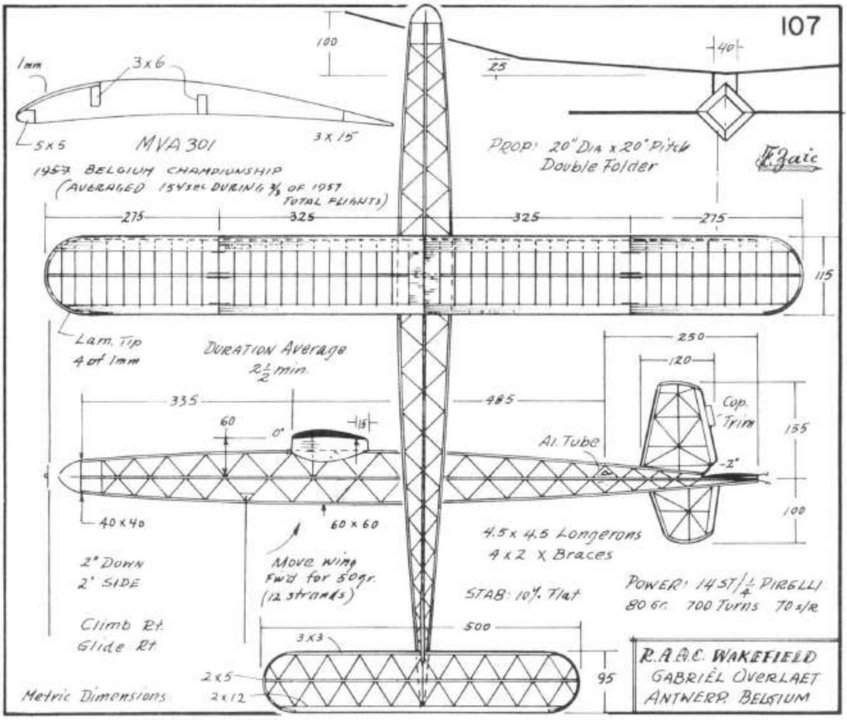
106

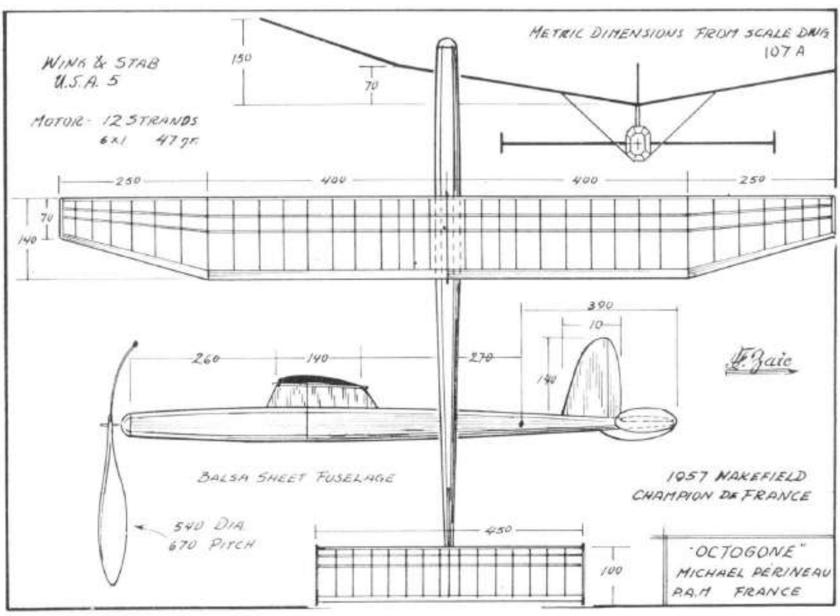


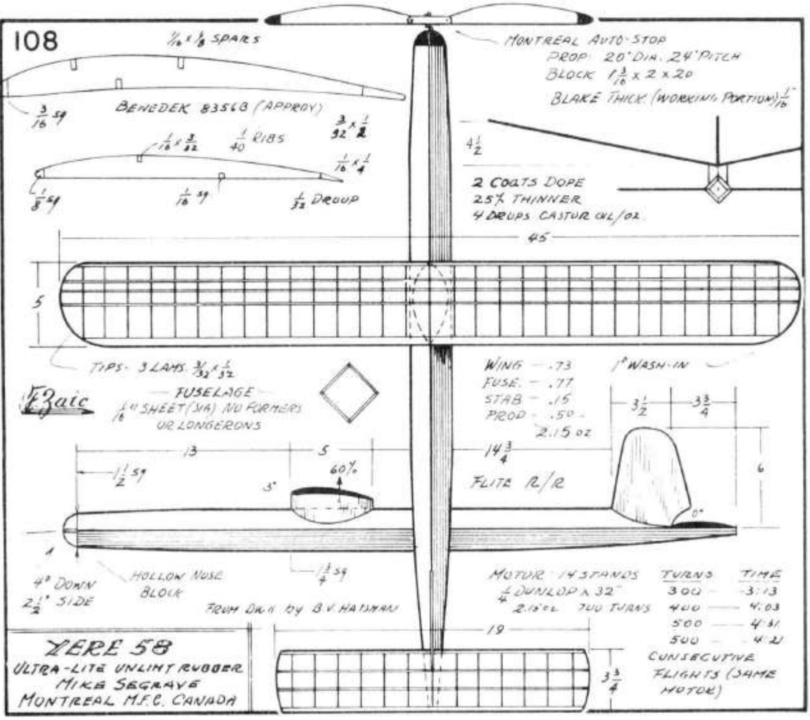
Prop Block 1×3×10½
24
Note: 1st 1956 Nats. 1st Mich. Elims 2nd State Meet
1/16 Tube
Fuselage silk covered
All spaces 2
3/16 sq. Longerons 1/16×3/16 Diagonals
2" sq
1½ sq
1⅝ sq
Note Diagonals
L.E. Wing For New Rules
Rubber Peg
1/20 Ribs
WAKEFIELD
EDWARD STOLL
Detroit, Mich.

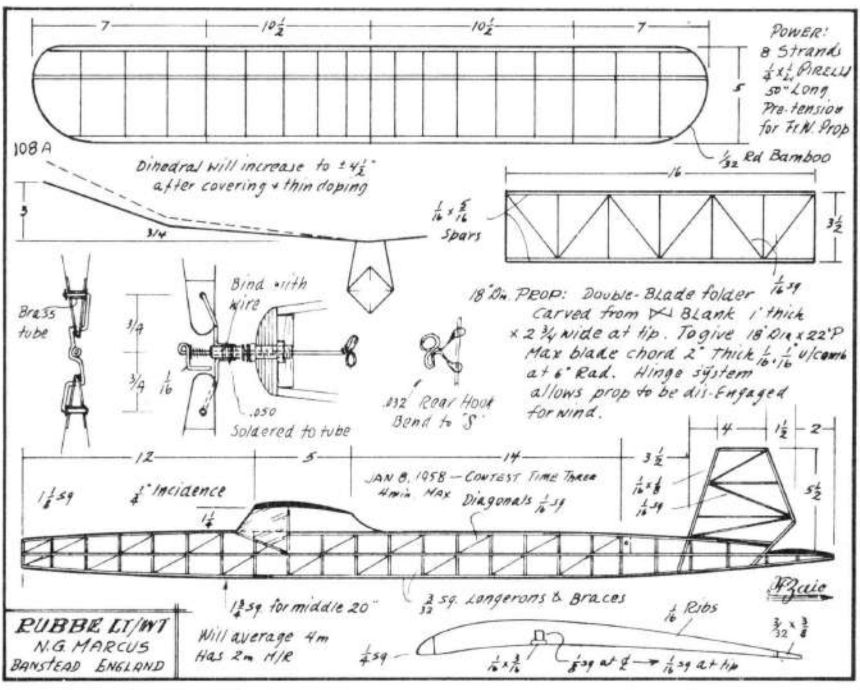


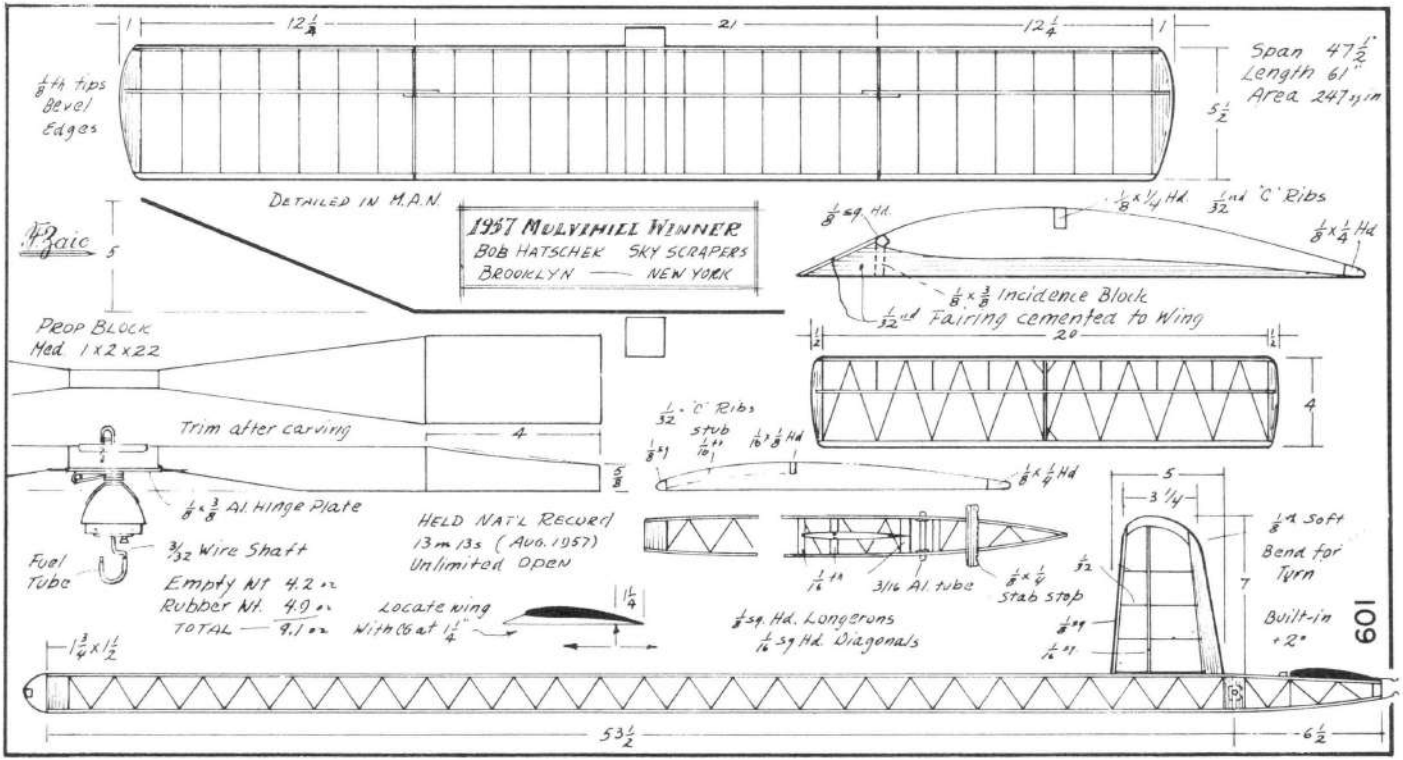
106 A
SM-10
WAKEFIELD 1956
J. J. SMOLDERS
opp.vleugel 14.06 dm²
„ stabilo 4.75 „
„ totaal 18.81 „
motor 24 str. 4×1 Pir. 80 gr
schroef diam 62 spoed 58.5 cm
motorloop 60-65 sec
gewicht 230 gram
prestaties: vers ingelopen motor 750t. regelmatig in "still air" ~ 4:30
AFSTELLING: rechts-rechts motorvl. steile rechterspiraal-glijvlucht wyde rechterbocht t.g.v. uitstaand tegenwicht, event. kleine correctie kielvlak
Z = zacht
M = middel
H = hard
3mm rechts
voor
6mm al. buis
Stabilo vlak profiel ribben 1mm L
vleugel
gelamelleerd 3lagen 1×3 L
kielvlak zyd verstelbaar
bedekking 1mm L
schroef tegen linker kant van romp - 3 lagen 1mm balsa op bouwmal
MVA 3of 3°-3½°
51%
poot
startpoot
ballast ~ 10g zwp.
bodem 1mm L

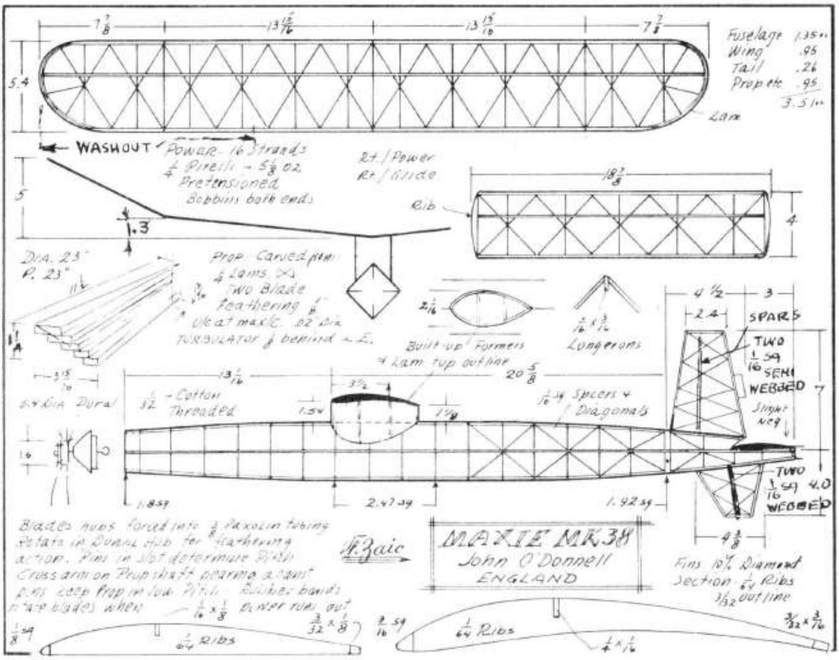

107
1mm
3x6
5x5
MVA 301
3 X 15
1957 BELGIUM CHAMPIONSHIP
(AVERAGED 154 sec DURING ⅔ OF 1957 TOTAL FLIGHTS)
PROP: 20" DIA x 20" PITCH
Double Folder
F. Zaic
100
25
40
275
325
325
275
115
Lam. Tip
4 of 1mm
DURATION Average
2½ min.
250
120
335
485
Cop. Trim
155
60
0°
15
Al. Tube
-2°
40 x 40
60 x 60
100
4.5 x 4.5 Longerons
4 x 2 X Braces
2° DOWN
2° SIDE
Move wing Fwd for 50gr. (12 strands)
STAB: 10% Flat
POWER: 14 ST/¼ PIRELLI
80 Gr. 700 Turns 70 s/R
Climb Rt.
Glide Rt.
500
3x3
2x5
2x12
95
Metric Dimensions
R.A.A.C. WAKEFIELD
GABRIËL OVERLAET
ANTWERP. BELGIUM

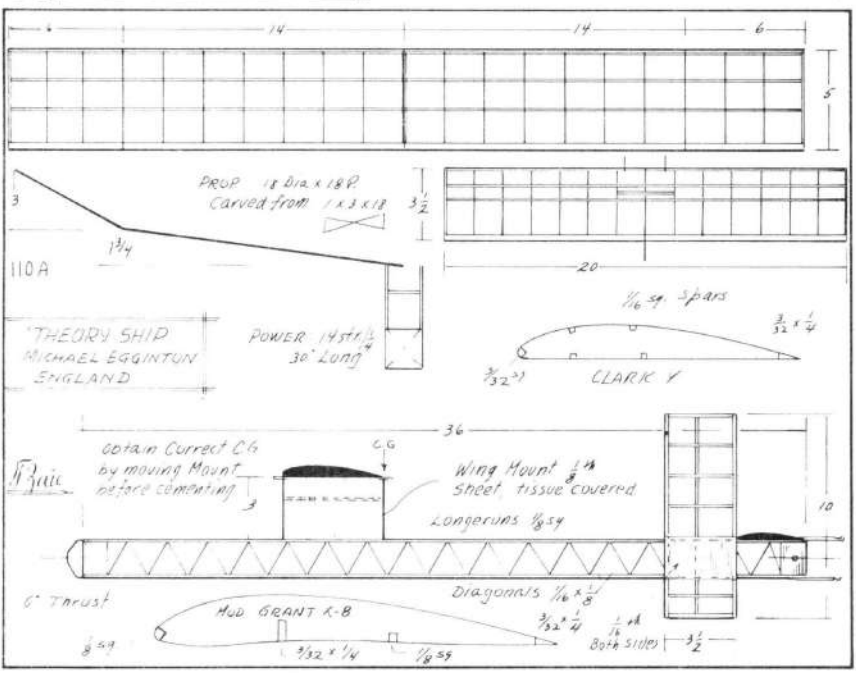

METRIC DIMENSIONS FROM SCALE DWG
107 A
WING & STAB
U.S.A. 5
150
70
MOTOR - 12 STRANDS
6x1 47 gr.
250
400
400
250
70
140
390
10
260
140
270
140
F. Zaic
BALSA SHEET FUSELAGE
1957 WAKEFIELD
CHAMPION DE FRANCE
540 DIA
670 PITCH
450
100
"OCTOGONE"
MICHAEL PÉRINEAU
A.A.M FRANCE

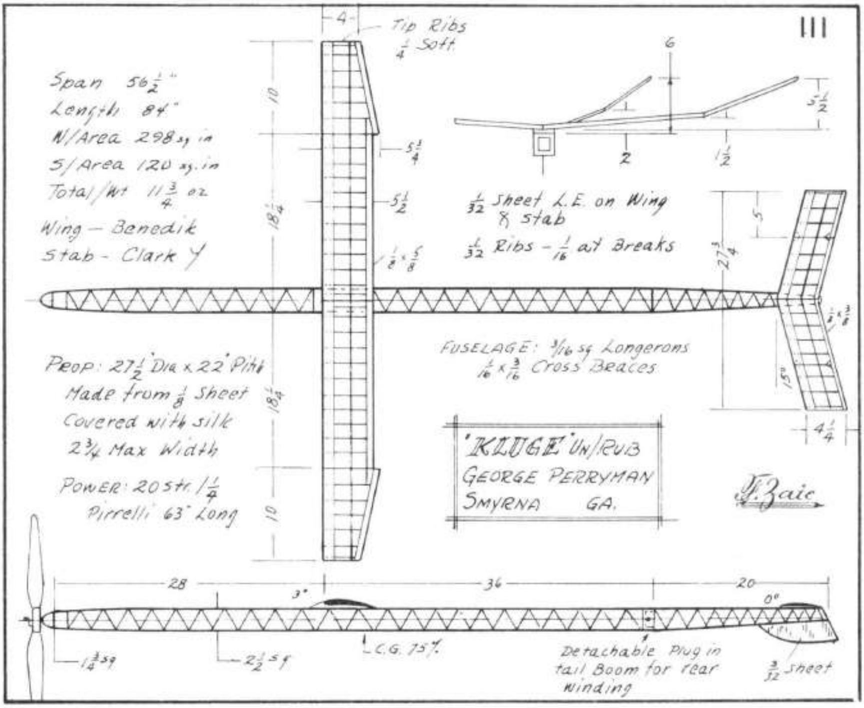

108
MONTREAL AUTO-STOP
PROP 20" DIA. 24" PITCH
BENEDEK 8356B (APPROX)
2 COATS DOPE
25% THINNER
4 DROPS CASTOR OIL/OZ
45
WING .73
FUSE. .77
STAB .15
PROP .50
2.15 OZ
1° WASH-IN
FUSELAGE
SHEET (3/A) NO FORMERS OR LONGERONS
60%
FLITE R/R
HOLLOW NOSE BLOCK
4° DOWN
MOTOR 14 STANDS
DUNLOP x 32"
700 TURNS
TURNS TIME
300 3:13
400 4:03
500 4:31
500 4:21
CONSECUTIVE FLIGHTS (SAME MOTOR)
FROM DWG BY B.V. HATSMAN
ZERE 58
ULTRA-LITE UNLIMT RUBBER
MIKE SEGRAVE
MONTREAL M.F.C. CANADA

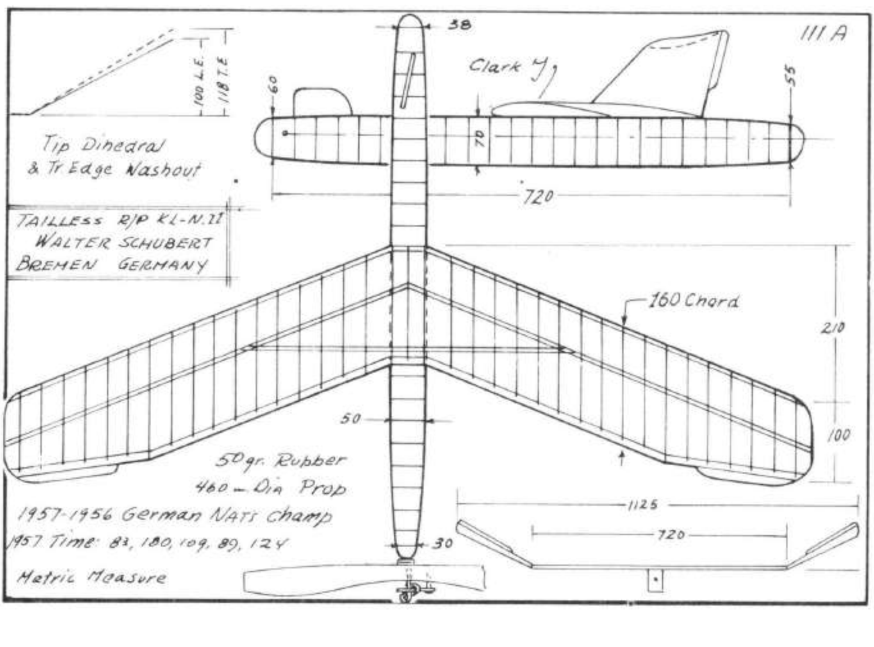

108 A
POWER:
8 Strands
PIRELLI
50" Long
Pre-tension for Fr.W. Prop
Rd Bamboo
Dihedral will increase to ±4½" after covering + thin doping
Spars
Bind with wire
Brass tube
Soldered to tube
Rear Hook Bend to 'S'
18" Dia. PROP: Double-Blade folder Carved from Blank 1" thick x 2¾ wide at tip. To give 18" Dia x 22" P Max blade chord 2" Thick at 6" Rad. Hinge system allows prop to be dis-Engaged for wind.
JAN 8, 1958 — CONTEST TIME THREE 4 min. MAX
Incidence
Diagonals
for middle 20"
Longerons & Braces
Ribs
RUBBE LT/WT
N.G. MARCUS
BANSTEAD ENGLAND
Will average 4m
Has 2m H/R


1957 MULVIHILL WINNER
BOB HATSCHEK SKY SCRAPERS
BROOKLYN — NEW YORK
Span 47 1/2"
Length 61"
Area 247 sq in
1/8th tips Bevel Edges
DETAILED IN M.A.N.
Zaic
PROP BLOCK
Med 1 x 2 x 22
Trim after carving
1/8 x 3/8 Al. Hinge Plate
3/32 Wire Shaft
Fuel Tube
Empty Wt 4.2 oz
Rubber Wt. 4.9 oz
TOTAL — 9.1 oz
HELD NAT'L RECORD
13m 13s (AUG. 1957)
Unlimited Open
Locate wing With CG at 1 1/4"
1/8 sq. Hd.
1/8 x 1/4 Hd.
1/32 nd 'C' Ribs
1/8 x 1/4 Hd
1/8 x 3/8 Incidence Block
1/32 nd Fairing cemented to Wing
1/32 'C' Ribs
stub
1/16 x 1/8 Hd
1/8 x 1/4 Hd
1/16 th
3/16 Al. tube
1/8 x 1/4 Stab stop
1/8 sq. Hd. Longerons
1/16 sq Hd. Diagonals
1/8 sq Soft
Bend for Turn
Built-in +2°
53 1/2
6 1/2
1 3/4 x 1 1/2


Fuselage 1.35
Wing .95
Tail .26
Prop etc .95
3.51
WASHOUT
Power 16 Strands
Pretensioned
Bobbins both ends
Rt / Power
Rt / Glide
Rib
Dia. 23"
P. 23"
Prop Carved from
Two Blade
Feathering
TURBULATOR
Built up Formers
Longerons
SPARS
TWO
SEMI
WEBBED
Cotton
Threaded
Spars &
Diagonals
Slight
TWO
4.0
WEBBED
Blades hubs forced into Paxolin tubing
action.
MAXIE MK38
John O'Donnell
ENGLAND
Fins 10% Diamond
Section
Outline
Ribs
Ribs


PROP 18 Dia x 18 P.
Carved from 1 x 3 x 18
110 A
"THEORY SHIP"
MICHAEL EGGINTON
ENGLAND
POWER 14 str
30" Long
Spars
CLARK Y
Obtain Correct CG
by moving Mount
before cementing
C G
Wing Mount
Sheet, tissue covered
Longerons
Diagonals
6° Thrust
MOD. GRANT X-8
Both sides


111
Span 56 1/2"
Length 84"
W/Area 298 sq in
S/Area 120 sq in
Total/Wt 11 3/4 oz
Wing — Benedik
Stab - Clark Y
Tip Ribs 1/4 Soft
1/32 Sheet L.E. on Wing & stab
1/32 Ribs - 1/16 at Breaks
FUSELAGE: 3/16 sq Longerons
1/16 x 3/16 Cross Braces
Prop: 27 1/2" Dia x 22" Pitch
Made from 1/8 Sheet
Covered with silk
2 3/4 Max Width
Power: 20 str. 1/4
Pirrelli 63" Long
"KLUGE" UN/RUB
GEORGE PERRYMAN
SMYRNA GA.
F. Zaic
C.G. 75%
Detachable Plug in tail Boom for rear winding
3/32 sheet


111 A
Clark Y
Tip Dinedral & Tr Edge Washout
100 L.E.
118 T.E
TAILLESS R/P KL-N.21
WALTER SCHUBERT
BREMEN GERMANY
160 Chord
720
1125
50 gr. Rubber
460 — Dia Prop
1957-1956 German NATS champ
1957 Time: 83, 180, 109, 89, 124
Metric Measure

June 22, 1957

Frank,

Here, finally, is an answer to your request for comments on the towing of gliders. No doubt it is too late to do you any good in this years book. Also I imagine you may find the effort too highbrow, or something along these lines. If you can tell me how to change it I might agree.

After such a long wait you are probably entitled to the little story behind the paper.

I started out to turn out something based on the British report, and actually got an attempt down on paper not too long after your requested dead line. But it bothered me! I didn't feel that I really knew the answers to some of the problems of the towline glider, steep climb for example, because the derivation didn't cover that and furthermore, I didn't have a really good feel for the degree of approximation. So—since this is a hobby with me, I must be satisfied first. I sat down to go thru the entire derivation adding a little to be more general and to look at each step with my own problem in mind. It took longer than I thought it would! It also took longer than I thought to figure a way to get the facts down with enough equations for the educated reader and simple rules to follow for the others who are more interested in the "what" than in the "why". I don't know whether I have succeeded or not—you can tell better than I.

The equations and symbols I used are conventional American notation (greek letters and included), and in my mind require no apology. Many modelers become engineers, many are engineers. Why not use the standard language as long as there is a translation available for other readers.

I flew my Nordic with the retractable forward fin in the eliminations, but between the weather and solving equations, I didn't have it completely trimmed. All of the tows were near perfect (they had better be) but the glide left something to be desired on two of the flights. The first stalled all the way to the ground. The third hit a down draft and stalled in gusty air near the ground. I could have qualified with one goof, not with two.

Good luck with your book.

KEN QUERMAN

Note: The fancy duplicator job was for the benefit of my local friends.

TOWLINE GLIDER STABILITY (During Tow)

by J. K. Querman ——— Dallas, Tex.

Skillful towing of gliders is something of an art, and it will probably remain so when I get finished. My purpose is to shed a little light on the factors which can change a stable glider into a demon when it is at the end of a line. I have attempted to convert some tedious analytical work to a few instructions which can be used as a guide in correcting trouble as it arises during the initial flights and can also be used to improve the stability while the design is still on the drawing board.

During the early years of World War II the British did quite a bit of work on the stability of kites, particularly those of high efficiency (high L/D). The results of these studies were later published in R and M 2303 "Collected Researches on the Stability of Kites and Towed Gliders" by L. W. Bryant, W. S. Brown and N. E. Sweeting, dated 1950. Since the towline glider is nothing more than a glorified high performance kite during the tow the data should apply directly. Unfortunately, the report may be difficult to understand unless the reader has an aerodynamic background. In the following notes I have attempted to translate some of the results into language more easily understood by modelers. A few equations are used as a bridge, but the rules derived from them can be used without following the equations.

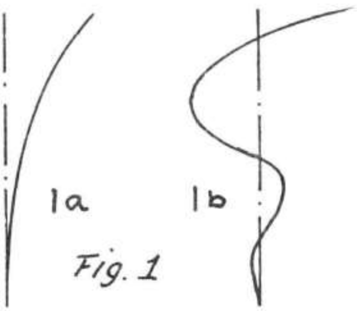
Keep in mind that since the studies were done for kites with the string fastened to a point on the ground with a steady wind, the results apply strictly to the towline glider when the tower runs in a straight line up wind. He is not allowed to make any corrections. The effect of "pilot" corrections and the direction they should take will be inferred from the results, but only roughly. It should also be noted that it is assumed that the model is trimmed to fly straight (with a tow rudder or similar device).

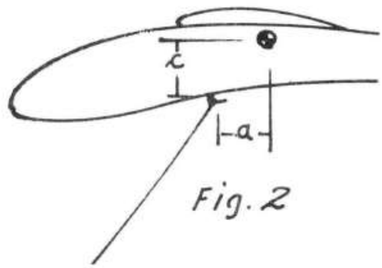
The process of solving the equations of motion becomes so lengthy and intricate that it is futile to atttempt to discuss a complete solution. The trick is to determine which terms are most important. These will vary depending on the conditions. Most of the present discussion is concerned with nearly level flight (small rate of climb) and a hook located some distance away from the center of gravity. Several other conditions, a steep climb, tow hook close to the CG and a very short line are discussed more briefly.

It may come as something of a surprise to see some of the conditions for stability written without any reference to the tension in the line. This does not mean that it was neglected. Instead, it means that the tension was cosidered strong enough to make the line term dominate. In other words it is the terms not dependent on tension which are neglected. There is no point in multiplying the resulting requirements by tension since it turns out that only the sign is in question.

Longitudinal stability is not usually a serious problem and will not be considered. On the other hand, I am sure the troubles with lateral-directional stability are well known. There are two basic types of instability, divergence and a divergence oscillation.

Plan views of the flight paths are shown in sketch 1.





Sketch 1a shows divergencies. The model veers off to one side and just keeps going to the same side at an increasing rate. (Note that if the model is trimmed to go straight it could fall off on either side. If there is a warp or slight circle remaining it will usually go in that direction.

The divergent oscillation is illustrated in sketch 1b. The model goes from side to side with an increasing amplitude.

Both of these instabilities are commonly observed and both can lead to disaster.

HOW TO AVOID DIVERGENCE

According to R and M 2303 divergence can usually be avoided if:

$$\left[\frac{c\,C_{n\beta}}{K_z^2} + \frac{a\,C_{l\beta}}{K_x^2}\right] \text{ is negative}$$

where

$C_{n\beta}$ = is the yawing (or turning) moment due to side slip. It is primarily a measure of the size of the vertical tail. It is normally positive and becomes larger as the vertical tail is made larger.

$C_{l\beta}$ = is the rolling moment due to side slip. It is primarily a measure of the dihedral. It is normally negative and becomes larger (more negative) as the dihedral is increased.

a = is the horizontal distance from the center of gravity to the hook. Positive when the hook is ahead.

c = is the vertical distance from the center of gravity to the hook. Positive when the hook is below.

K_z = is a moment of inertia coefficient (radius of gyration) about a vertical axis. It represents the distribution of weight away from the axis or laterally along the wing and longitudinally along the fuselage. The value is large when mass is concentrated at the wing tips and/or at the ends of the fuselage.

K_x = is a moment of intertia coefficient about an axis in the direction of flight. It represents primarily the distribution of mass along the wing. The value is large when mass is concentrated near the wing tip.

Both of these inertia terms are always positive, and should not be thought of as tools for fixing the stability. They are included for completeness and to show a difference between configurations. For example, K_x and K_z are nearly equal for a tailless glider. But since a long fuselage adds to K_z and not K_x the conventional glider has a larger K_z. This makes the fore and aft location of the hook,"a," relatively more important.

It is evident then that divergence is avoided by using a small vertical tail, plenty of dihedral, and a tow hook well forward of the center of gravity but only a small distance below. If in spite of everything, divergence appears during tests, all or any combination of the following changes should reduce or eliminate it.

A. Design Changes

1. Move the hook forward
2. Move the hook up
3. Lower the center of gravity
4. Remove vertical tail area
5. Add a vertical fin ahead of C.G.
6. Increase dihedral

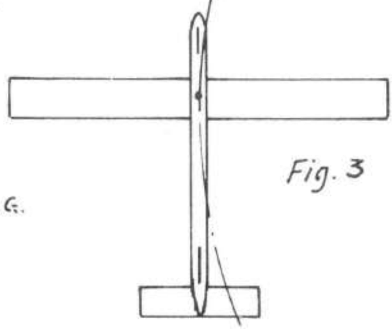


Fig. 3

B. Foot work

1. Run laterally in the direction of the turn. Try to get on the other side of the model.

2. Reduce the tension on the line. According to the approximation above, this should not affect the stability. However, by reducing the tension the effect of the towline becomes less important. As one might expect, if the lines are allowed to become slack the stability reverts to the normal free flight stability which can then cause recovery. When tension is applied again to tow the glider, the glider will diverge again—and it may go in the opposite direction. Repeated application of the tow could make the glider oscillate, even though it is divergent. This type of oscillation is pilot induced and should not be confused with the divergent oscilation which occurs when the pilot makes no corrective action.

How to Avoid A Divergent Oscillation

According to R and M 2303 a divergent oscillation can usually be avoided if:

$$\left[\frac{c\,C_{n_\beta}}{K_z^2} + \frac{a\,C_{l_\beta}}{K_x^2}\right]_1 + \frac{C_{Y_\beta}}{\mu}\left[\frac{c\,C_{n_r}}{K_z^2} + \frac{a\,C_{l_r}}{K_x^2}\right]_2 \text{ is positive}$$

In addition to the definition used before,

C_{Y_β} = is the sideforce due to sideslip. It is primarily a measure of the side area. It is always negative.

μ : is a mass coefficient. It represents the ratio of the average density of the model to the density of the air.. It increases if either the model weight is increased or as the air density decreases.

C_{n_r} is the yawing moment due to a yawing velocity. It is best visualized by imagining the model to be flying a circular path with the angle of sideslip at the center of gravity equal to zero, as shown in sketch 3. The local angle of attack ahead of the center of gravity is positive while the local angle is negative behind the center of gravity. Note that both effects produce a turning or yawing moment which tends to stop the turn. This is a negative C_{n_r}. C_{n_r} is always negative. It is made larger (more negative) by adding fin area either ahead of or behind the center of gravity. However, if fin area is added only at one end C_{n_β} is also changed. C_{n_r} can be changed without influencing C_{n_β} by adding fin area at both ends simultaneously. It can also be increased by adding drag to both wing tips since the tips move at a different speed during the turn.

$C\ell_r$ = is the rolling moment due to a yawing velocity. Return to sketch 3. Positive dihedral ahead of the center of gravity will tend to roll the model away from the turn. Similarly, negative dihedral behind the center of gravity will also tend to roll the model away from the turn. This is a negative $C\ell_r$. The difference in speed of the wing panels also produces a rolling moment. When the lift is positive, the outside wing moving faster produces a rolling moment toward the turn. This is a positive $C\ell_r$. Thus, a model may have either sign for $C\ell_r$. Unless special attention is paid to the tail and dihedral the wing effect will predominate, particularly for high aspect ratios, producing a positive $C\ell_r$. Positive dihedral ahead of the center of gravity and negative dihedral behind will help produce the desired negative value. Washout in the wing tips will also help.

If the model is to be stable for divergence as well as for oscillations, then the term in the first bracket [ ], must be negative, since this is the only requirement discussed previously. It follows that fixing a divergence could lead to an oscillation. Hence, there is at best only a narrow band of complete stability. The size of the band is influenced by the second term. If it is a very large positive number, then there is a lot of room to play and the model should be very easy to adjust. It is important, then, to make it as large positively as possible, particularly during the design stages. This means:

$$\frac{Cy_\beta}{\mu}\left[\frac{c\,Cn_r}{K_z^2} + \frac{a\,C\ell_r}{K_x^2}\right] \quad \text{must be as positive as possible}$$

Cy_β is always negative and is merely a multiplying factor. It makes an unstable model more unstable and a stable model more stable. It may be dangerous to fool with unless you know the whole term is stabilizing. In this case a large side area and a small mass are in order. To insure the stability

$$\left[\frac{c\,Cn_r}{K_z^2} + \frac{a\,C\ell_r}{K_x^2}\right] \quad \text{must be negative.}$$

This is done by using ample fin area ahead of and behind the center of gravity and by using dihedral ahead of the center of gravity and negative dihedral behind. Since a fin gives some effect dihedral, forward fins should be on top, aft fins on the bottom. The tow hook should be back close to the center of gravity along the fuselage, and well below the center of gravity unless it is known that enough measures have been taken to change the sign of $C\ell_r$ to negative.

During the flight tests, the following changes can be made in any combination to eliminate a divergent oscillation:

A. Design Changes

The first six changes lead toward divergence and should be used sparingly.

1. Move the hook aft
2. Move the hook down
3. Raise the center of gravity
4. Add vertical tail area
5. Remove vertical fin if any from ahead of the center of gravity
6. Reduce dihedral

The last six changes should help without leading to divergence.

7. Add fin area ahead of and behind the center of gravity simultaneously
8. Put negative dihedral in the horizontal tail
9. Move vertical tail down
10. Add positive dihedral to any surfaces ahead of the center of gravity (move forward fin up)
11. Add drag to both wing tips } (not recommended because of performance penalty)
12. Washout the wing tips

B. Foot Work

1. Anticipate the motion. When the model starts to the right pull it back. When it starts back to the left pull or run to the right, even though the model is still at the greatest displacement to the right.
2. Never pull or run in the direction of the side motion.
3. Release tension on the line. This should allow the free flight stability to help if the model is essentially gliding with the line attached.

A few general comments on the effect of the corrective action of the tower seem in order. It is usually easiest for an airplane pilot to control divergence since the motion is relatively slow. The towline jockey may not agree. To correct divergence he must run in the direction of the turn. Not only is this contrary to his instinctive reaction, it will require a lot of running. In fact, in a strong wind it may become impossible to run fast enough.

The oscillation, on the other hand, requires a normal corrective pull. The problem is to avoid over correction. If stability should be unattainable then it is desirable to help the "pilot" by increasing the length of the period. If it is long enough, the "pilot" will be able to apply corrections without effort. The pull of the line tends to increase the frequency, but this effect can be minimized by keeping the absolute value of the distance, a, small and, of course, by keeping the line tension small.

Can gliders be towed successfully without meeting the requirements for complete stability? As I have indicated in the previous paragraph, I have no doubt that it can be done, but the pilot (tower) must make up for the difficiencies of the model by his skill. Let me illustrate by an analogy. A tricycle will stand up by itself and can be ridden by anyone who can reach the pedals. A bicycle won't stand alone and usually won't cooperate with a rider on his first attempt. With a little practice, however, most people make a bicycle seem stable without trouble. The unicycle is another step down the line. Experts make unicycle riding look easy, but few people qualify as unicycle riders.

By my standards a stable towline glider corresponds to the tricycle. There is no need to even watch the model; certainly no ballest is needed to jockey the model into position. I realize that this is a severe requirement and may result in performance losses during the glide. Thus to gain a better glide, we may proceed to the bicycle stage. Now the model needs watching and some corrective action, but this may be done so automatically by the experienced modeler that it is hardly noticed. I leave the unicycle stage to those who must have the last drop of performance and do not mind the practice and patience necessary to master the tow.

The question of how to establish the boundaries of these regions is a difficult one which must be done, I suspect, by trial and error.

ADDITIONAL NOTES FOR OTHER CONTITIONS

Steep Climb

The requirements for stability in a steep climb are very similar to those for nearly level flight. In fact, it is easier to avoid divergence. A glider which does not diverge in level flight will not diverge in a steep climb. Corrective action required to eliminate a divergence are the same.

Oscillations are probably more likely to occur but the same treatment as for level flight should provide a cure. Unfortunately, it is not clear that certain terms are negligible. Thus there may be other corrective measures not brought out in this note.

Hook very close to the center of gravity

It appears from the analysis of the motion that most of the destabilization due to the line is caused by the rolling and yawing moments produced by the tension in the line and not by the side force from the line. This suggests that it is desirable to place the hook at or very close to the center of gravity. In this way these moments will be negligible. Of course, the sode force still remains.

When this is done, new terms become important:

To avoid divergence

$$\left[C\ell_p\, C_{n_\beta} - C_{n_p}\, C\ell_\beta\right]$$ Must be negative

This is similar to the previous requirement except that

$\frac{c}{K_z^2}$ is replaced by $C\ell_p$

and $\frac{a}{K_x^2}$ is replaced by $-C_{n_p}$

$C\ell_p$ = is the rolling moment due to a rolling velocity. It is always negative and relatively large. It is largely a measure of the wing aspect ratio.

C_{n_p}. is the yawing moment due to a rolling velocity. It is normally negative but small.

It would appear that a normal stable glider will automatically meet this condition.

To avoid an increasing oscillation

$$\left[-C\ell_\beta\, C_{n_p} + C_{n_\beta}\, C\ell_p\right]$$ must be negative

This is similar to the second (and important) term discussed at length in the previous requirement except that:

$\frac{c}{K_z^2}$ is replaced by $-C\ell_\beta$

and $\frac{a}{K_x^2}$ is replaced by C_{n_β}

All terms have appeared before. Since $-C\ell_\beta$ and C_{n_β} are both positive as a and c were, the changes not depending on the hook location, i.e., 7-12 on page 118 are still valid. The changes 1-6 on page 118 are replaced by:

1. Increase dihedral
2. Reduce the vertical tail area } (unless enough measures have
3. Add fin area ahead of the CG } been taken to make $C\ell_p$ Negative)

For most cases $-C\ell_\beta\, C_{n_p}$ is much easier to make large than $C_{n_\beta}\, C\ell_p$ so that the rules reduce to

1. Increase dihedral
2. Add vertical tail area ahead of and behind the center of gravity simultaneously.

There is one advantage in placing the hook too close to the center of gravity which does not show up in the conditions for stability. This is the ability of the glider to follow in the direction it is towed. With the tow hook exactly on the center of gravity the glider is not affected by the direction of tow. This probably represents an unsatisfactory condition for the modeler because it makes it difficult for him to keep the model headed into the wind. It might be marginally acceptable in calm weather, but any net turn left in the trim would require the tower to run in a circular path. In a strong wind a turn could cause real trouble. In any case it will be essential to have a well adjusted tow rudder. Trim is not so critical for a stable configuration with the hooks away from the center of gravity.

Very Short Lines

As the towline is made shorter, i.e., not many wing spans long, it becomes increasingly difficult to avoid unstable oscillations.

Probably the best way to minimize this tendency is to place the hook close to the center of gravity. In addition, a large negative value for C_{n_k} is desirable (forward fin). Most of the rules previously given are still good, but they may have to be applied more carefully.

Fortunately, very short lines need not occur unless the tower chooses to reel in the model rather than launch it.

Very Long Lines

Complete lateral stability is easier to obtain on very long lines (much longer than normal), but the problem of trim becomes more critical. As the lines are lengthened, the glider loses its ability to follow in the direction of the tow. If the glider is trimmed to circle, even by a small amount, it is very likely to do so in spite of the line. With shorter lines the tension on the line can overcome some normal circle.

This tendency can be minimized by placing the hook a considerable distance from the center of gravity and by increasing the line tension. However, since this is contrary to other requirements, particularly the short line requirements it is probably better to use a well adjusted tow rudder (or equivalent) to trim the glider for straight flight during the tow.

Test Technique

The comments on long and short lines suggests that first tows should be made with moderate to normal tow lengths. Very short lines do not appear to be a good idea. When tows at this length are satisfactory, very long lines should be used in getting the best setting for the tow rudder. Very short lines should be approached gradually to determine any changes which will give a greater margin of safety from unstable oscillations.

PENDULUM "TUNE TAB"

by Don Tune and Jack Block —————— Los Angeles, Calif.

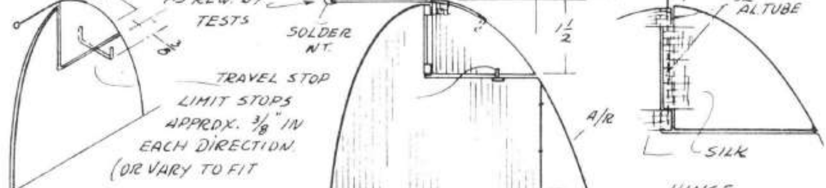
This simple pendulum tab features ease of construction, and when properly used, it gives the glider the consistency of tows which we dream about. It is not a cure-all and it should not be construed as such.

To use the Tab properly, lock it in a neutral position while you adjust your glider for its maximum tow possibilities with the usual auto-rudder set-up. The reason for this procedure is obvious; you should correct all inherent faults of the glider so that the Tab will not work against overwhelming odds. After you have obtained satisfactory tow under ideal conditions, if necessary, turn the Tab loose. Now try to get a bad tow. If it does not work right away, do not become discouraged. Check it for free floating and reaction to the slightest banking or tilting position of the glider. It should give opposite "rudder" effect to correct off-center veering during tow. It may be necessary to adjust your limit stops for over or under correction, or readjust the weight on the end of the pendulum wire. The main thing is to keep at it until it functions for your particular design.

In our tests with the "Tune Tab" we tried it on gliders with very poor towing characteristics, and we were able to tow them to the top of the line successfully, although there was still room for improvements.

On a normaly good towing glider, the results were exceptionally good. We tried in vain to make a bad tow by launching poorly, towing cross wind, etc. We were able to bring the glider to the top EVERY TIME. Of course, you still have to exercise care at the top of the release so as not to whip the glider into a stall.

We were worried about the effect of the Tab during normal circling. But our worries were soon forgotten. The Tab made noticeable corrections to the bank of the glider, but it did NOT open the circle appreciably. This flatter circle, in fact, improved the thermal riding ability of the gliders. This was an unexpected blessing. Models which



had a tendency to spin in a strong thermal, rode the thermals beautifully when using the "Tune Tab;" never again coming close to their former or "no tab" spinning tendencies.

The location of the Tab need not be as shown, but it does seem to be the best place for it without cluttering up the glider too much. We tried the Tab in several different places; top of rudder, in front of rudder, attached to the fuselage, etc. It seems to work no matter where it is placed. Juts make sure it has a decent moment arm behind the C.G., and that it does not work in a position where it may be blanked out during tow or glide.

Do not take our word that it works. Spend 15 minutes of your time and install one on your glider. You will not regret it.

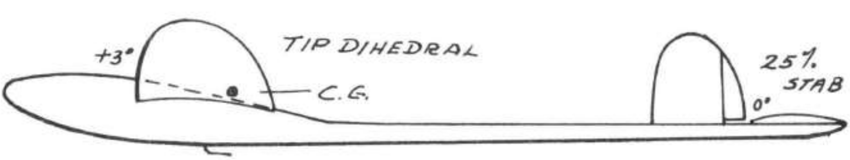
COMMENTS ON A-2 by Pete Buskell England

Only other thing of interest in the past year was in glider. Margaret builds the old A2, and not knowing much about them we drew up a droop snoot "a la" Lindtner. It towed like a wild horse and had habit of dropping one wing on glide.

The C.G. was almost exactly on the tow-hook, a layout recommended by a certain gent in the Aeromodeller a short time ago. It seemed to me that lowering C.G. down to the tow-hook position was the most likely cause of trouble. It also occurred to me that if possible all areas should be kept above the tow-hook i.e., no underfin or drooped nose.

We built a ship to these requirements using the original wing and stab and it towed like a dream, you just stand there and it goes up overhead. Should the launcher send it off out of line, the flyer must run towards the line the ship is taking, i.e., you cannot alter its course by slackening the line and pulling the nose around.

Some say that the upswept nose acts like a forward fin, though this undoubtedly contributes. I do not think it is the sole cause, as I have seen several forward fin layouts which did not tow well. Also, I think you will agree from the enclosed sketch, the area disposition is not all that different from the usual straight nose. I should think that the large amount of dihedral Lindner uses is a "must" to make it tow.

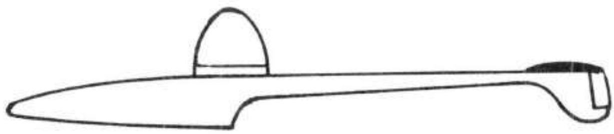


NORDIC DEVELOPMENT

by M. D. Andrade —————————— Oakland, Calif.

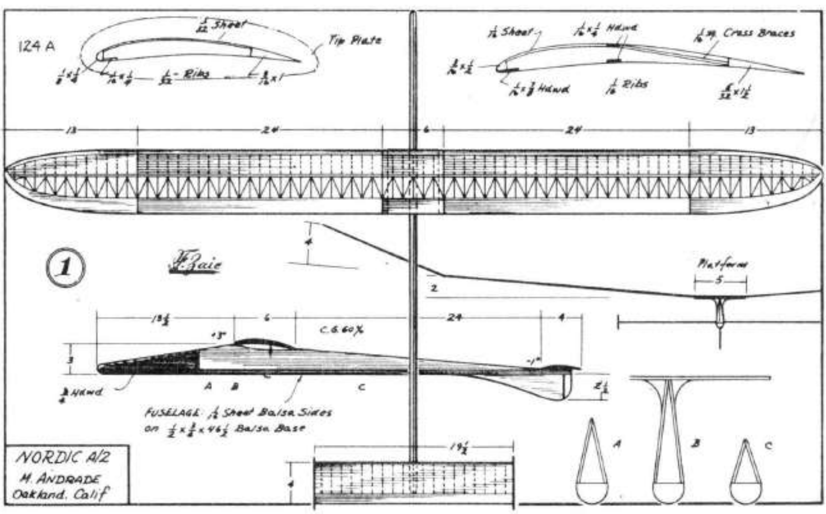
Enclosed are two sets of plans for Nordic gliders. I will try to explain their development.

My first experience on Nordic was model built four years ago. The then prevailing rule allowed miles of tow line and so I went strictly for a control tow setup—long nose and auto-sub rudder like this:



The model was very successful for tow but it took me 2 years to write it off to experience—a 12% airfoil and 40% tail area. This configuration was good in a dead calm or with a 6 oz. payload but that is all.

About that time Hank Cole came out with an interesting Nordic design which I believed had real possibilities. Using his fuselage arrangement. I build the model in Plan No. 1. Originally the model had a 3 x 26 in. stab. Although the planned stab worked—the model would accelerate in speed when it hit a thermal, alas, I could not D/T it. I am sure I hold some kind of record for number of loops and/or number of flat spins in 50 feet.

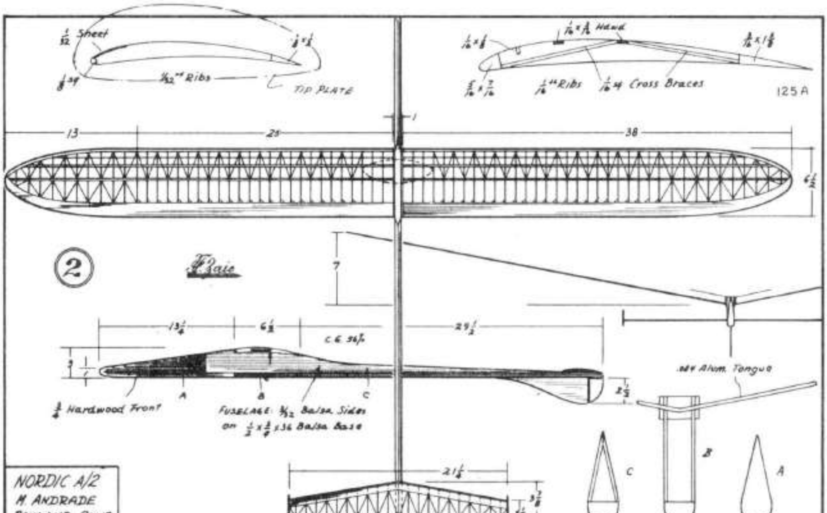


I changed over to a 4 x 19½ stab and the pop-up was easy and the glider did not get hurt much. A warped wing eliminated me on the final eliminations last year with this model.

The structural disadvantage of a long, wing leaning toward small tails, and what I saw in Germany in '55 lead me to plan No. 2. Wing and stab are based on Lindner's 1954 Nordic Winner (1955-56 Year Book) and the fuselage arrangement on what I have been using. The two piece wing takes care of warps and breakage problems, (I hope), and strangely enough the tapered small stab D/Ts OK.

I have only had one model where any trouble was experiences in towing. I build a long nose sub-ruddered fuselage for a set of wing/stab with the idea of a spare Nordic in case of emergency during '55, as per plan No. 1. As an experiment I chopped ½ of nose off and stuck on some lead for balance. To say the least, it was a flop. I could not use it except in dead calms, and it still was a case of nursing it up even with auto-rudder. Whether it was the short nose of the model or weight concentration (mass inertia) I did not find out. I still do not know what makes a good tow, but I have found a configuration that seems to work OK.

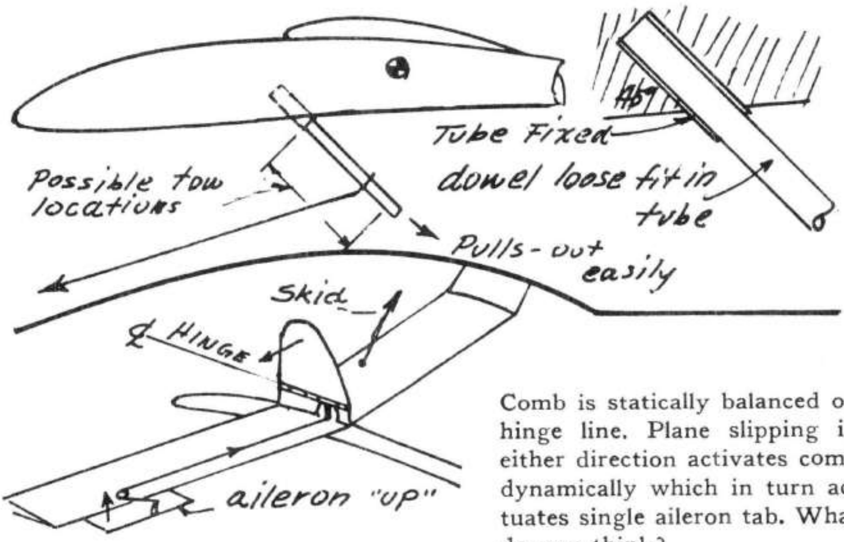
My combination is the result of finding out that sub-rudders are better. A solid cross adjustment like Carl Rambo's Nordic (pg. 150 1955-56 Year Book) is steady in towing. (I do not use it now but I have). A long slim nose seems to dampen towing jitters, and a middle approach to balance point (small stab) as individual contributions, also help.



TOW HOOK & CONTROLLER

by Bill Lane ——————————————— Los Angeles, Calif.

Right now I am getting ready to try out another towing gimmick (it works on paper). I believe the sketch will explain the idea satisfactorily. I also have another idea which I have been trying to get time enough to build for some three or more y ears. I call it Cox-Comb-Controller and it works something like this:



Comb is statically balanced on hinge line. Plane slipping in either direction activates comb dynamically which in turn actuates single aileron tab. What do you think?

The JATO ½A is a development of the JATO (first blood at Wichita Nats). The best we could do at Wichita was fourth place in "B" but after that time it did ever so well out here along the coast. Since that time the design has evolved from one extreme to the other (about six intermediate models). Where the model was formerly 24 inches in length with a 320 sq. in. wing it is now 36 inches long with same wing, but the stab area has been icreased to 37%, formerly 27%. The NACA 6409 went by the board at least two years ago and is now replaced by a "wiggle" of more moderate proportions. The glide did not appear to suffer, but the real effect was in the climb and ease of trimming. I might mention that I have not looped the model since about two years ago, and I believe that you can attribute that to the new airfoil. PLAN Page 64

The A-2 has nothing new in the way of gimmicks or design but it is a pleasure to tow, and under normal conditions it is always a contest threat. It rather closely follows the Austrian school of design. Fuselage construction is a'la Lindner. MVA 123 wing of 465 sq. in. and 1 18% stab of similar section. PLAN Page 152

NORDIC CHARACTERISTICS

by G. J. Lefever —— England

We have now completed the first two A/2 Team Eliminators and the top 25% in each area will go forward to th efinal trials meeting. Bob Amor and I have both been fortunate and came out third and first in the East Anglian Area for the aggregate of 10 flights. I managed 21 min. and Bob had 19 min., and as there was a strong wind on both days we both flew ALTAIRS.

This brings me to a few notes on A/2s. With conditions we get in England where two out of every three contest days are very windy, to develop a 3 min. A/2 and fly it in all the elims. is not a good proposition at all. I feel that the Thoman-Lindner type model would not stand much chance of even getting as far as our trials meeting. Bob and I find that the AITAIR is ideal for rough weather even though it will not better much more than 2 min in still damp air.

We are both working on still air type Nordics for our trials meeting in case it should be calm and still. They follow the standard Central European trend in design and have spans of 7 feet, lengths 3 ft. 6 in. to 4 ft. and 15% tailplanes. The sections we are using are Benedict and Lindner and we are both making the designs as clean as possible.

The two different types of Nordic require somewhat different towing characteristics. The rough weather type should be very directionally stable on tow so that even in a gale, and when running forward as fast as possible, the model still goes straight up. Even when flying the turn should be fairly tight and positive (no wandering about).

General Characteristics of Rough Weather Type

1. Fairly generous dihedral (preferably poly or tip.)
2. Not too long a moment arm (easier to maintain in a tight turn)
3. Reasonable size tailplane (25%)
4. Not too thin a wing section (S. I. 53009 good)
5. Not too small a fin.

The still air type is a different kettle of fish. The model on tow must still be very stable but not so directionally positive. The tow hook must be longer so that the model can be towed around in search of lift without fear of coming off the line. This is, of course, an art and the continentals are very skill at it. We do not have much opportunity of practicing this "lift hunting" with our climate.

The tow hook position is quite critical in both cases, and the best found by suspending the model by the tow hook, when the model should adopt a slightly "nose down" attitude. This position is usually about ¼ inch. in front of the C.G. which is best between 55% and 65%.

For the still air model aiming at the magic 3 min. plus, everything must be done to cut down parasitic drag. For example:

> Small cross section fuselage: Efficient, clean fuselage-wing joint. Good finish. Also very efficient thin sections should be used, and it seems that tailplane sections should be similar to the wing sections.

One other point which seems very important in both cases is the Longitudinal Moment of Inertia of the model. Without going into technicalities this is equal to the sum of all "masses x distances squared" from the line through the C.G. This means that the rear of the fuselage and tailplane should be made as light as possible and consequently the nose weight also. The weight concentrated is concentrated around the wing and a far better stall recovery is obtained. Ideall ywhen the model stalls the model should only rock about the wing and not dive up and down doing 20 to 30 ft. stalls. A good illustration is the average Wakefield which by necessity has its mass distributed well away from the wing and which as a general has a poor stall recovery.

NORDIC DESIGN AND TRIM

by N. G. Marcus — England

Regarding your request for some notes on A-2s please remember that I have never won an A-2 contest and hence cannot be classified among the "elite." I have reached the final "Trials" each year in England, but have always been out of luck in making the team. So here are my basic rules for a new model.

1. Follow the basic trends of glider designs.
2. Keep a reasonable amount of side area, especially near the nose.
3. Use as small a fin as possible.
4. Always fit Auto-Rudder above or on the Center Line of the fuselage. If fitted below center line and a large rudder deflection is used, it can cause spinning, especially in windy weather.
5. Use an efficient Auto-Rudder system (that does not involve thread or rubber bands if possible, as these are affected by atmospheric changes).
6. Always build under 14½ oz. finished weight (wings 5 oz. max.) and add ballast at the C.G.
7. Use a fairly large dihedral angle on wings—about 12½ degrees which represent about 7 inches at tips on average A-2 wing.
8. Fit towhook at 40%-45% Wing Chord.
9. When towing-up, always run towards the direction that the model goes if it veers over to one side. Many people run away from the model and this worsens the effort.
10. And finally, remember all glider contests are a lottery, and the model does not necessarily win. MINE DON'T! PLAN Page 148

NORDIC COMMENTS

JOE BILGRI ——————————————— San Jose, Calif.

I guess it is guys like me that make putting out books difficult. But when it comes to drawing plans, there are about a thousand other things that I would rather do.

My Nordic is coming out in the April issue of Flying Models, otherwise I would have been glad to send it. Although I was a little disappointed with its showing in Italy, I can only blame myself for guessing wrong in sending a model which I figured would stand a chance, regardless of conditions; meaning wind, rain or calm.

My biggest disappointment came when I read an editorial by one of our magazine editors who does not seem to be able to read any flight time that does not have U. S. A. connected with it. Meaning that I do not think that he looked up the results of the Defending Champs (Italians) who, outside of one man placing 22nd, were right down there with us. Perhaps he would have an idea what kind of Nordics we do fly if he attended some of our elimination contests. But I do not blame him if he did not attend them because for the past couple of years contest directors from all over the country reported pretty miserable weather.

If the eliminations out here are comparable to the rest of the country, about half or more of the entries are either built from plans of past Nordic winner, or pretty good copies. But they do not seem to do well in Spring weather, and very few ever get through the first eliminations. As I see it, you cannot blame a person for building a Nordic to suit conditions in which he does most of his flying. And if his type of model does not fit 100% into weather conditions of the International meet, what do you do?

With the holding of the elims in the Fall months, which is being started this year, the requirements will be for a calm weather type of Nordic design to win place on the team. So, maybe when this happens, the Finals will be held in Sweden or some other windy place. But at least we will not be the only ones behind the eight ball.

I am sending you couple of Wakefields. I usually build a new one every year whether I need or not. I always hope that the changes I make in the new one will make it far superior to the old one. Although it has always been my belief that the design and airfoils are of secondary importance to a good prop-power combination, adjustment, and the ability to wind a model to near capacity. PLANS Pages 143 99

TOWING TECHNIQUES —R. C. AMOR — England

Thanks very much for your letter. I was very interested to read your remarks on flying in tight circles and also on towing techniques.

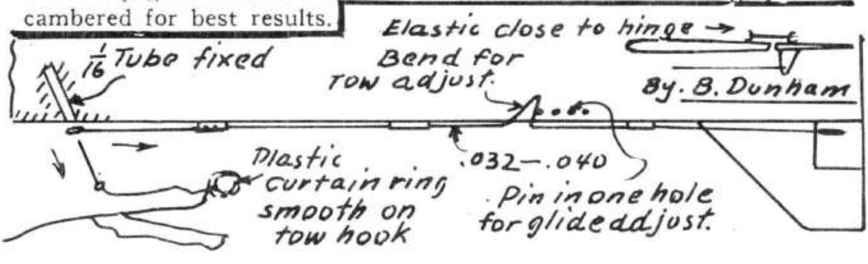
I agree with you flying in circles is essential for competition flying. I have found that performance suffers if the circle is too tight on a calm day, and I therefore, normally trim the model tight and slightly underelevator for windy conditions only. Then the calmer the day the more I open the circle diameter, altering the stops on the auto-rudder until the model is just off the stall. This method of trim for varying wind strengths enables trimming to be done on the competition day without actually altering the incidence on the stabilizer. Diameter of the circles would be about 50 ft. for a tight circle, and 100 ft. for one on a calm day.

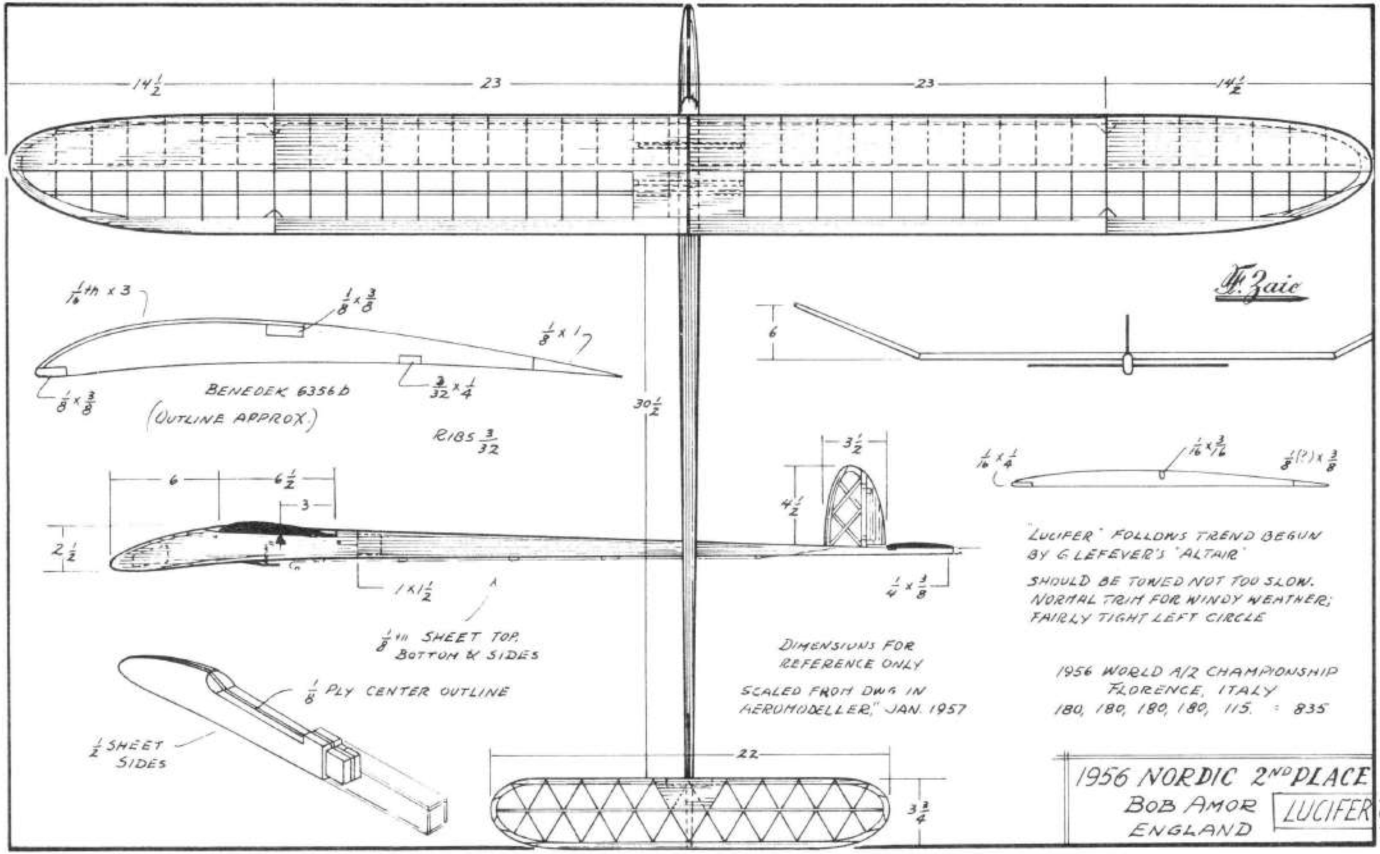
As regards towing, I think the important thing is to have a fairly small fin, but placed well away from the wing (long moment arm) and in front of the tail to avoid blanketing as much as possible. I do not like the idea of a forward fin, from watching other models fly, although I have never tried it myself.

I have a short nose on my model and generally try to keep the side area and cross sectional size of the fuselage as small as possible to cut down drag. I have found that to get good towing C.G. should not be more than ⅔ rds. back from the L.E., and tow hook not more than ½ in. in front of C.G. This gives a faster climb of course, especially in a wind, but a much straighter tow. I believe that to get the hook up under the wing as near as possible, i.e., very little depth to fuselage also helps the tow. Of course, the worst offender is warps! If a model is warped in anyway I think you might just as well give up trying!

One or two tips I picked up in Florence: Undercambered stabilizer gives flatter glide and smoothens tow. This seems to work in practice, although I have only used it on one model so far. Italians seem to think a smooth and highly polished top surface of the wing is very important; most of their wings were completely sheeted on top surface.

I have come to the conclusion that a thin wing section is most important. I have been using a Benedik wing section about 6% thick with very good results. I think the section should also be highly undercambered for best results.





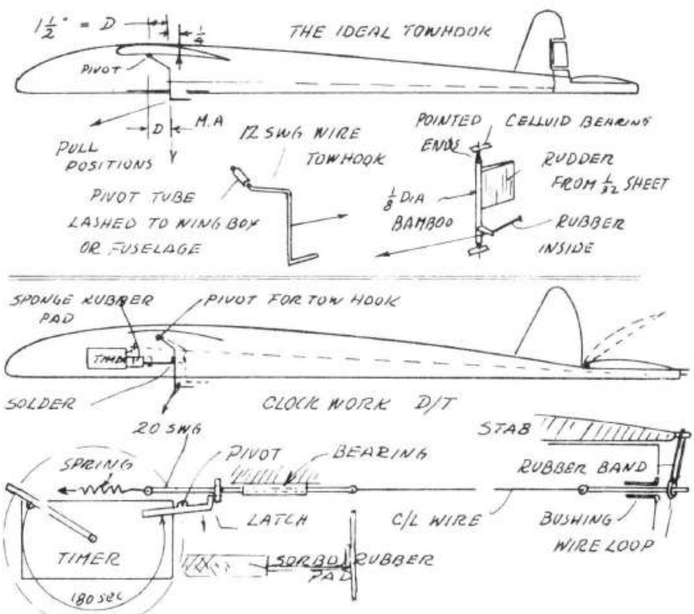
14 1/2
23
23
14 1/2
1/16 th x 3
1/8 x 3/8
1/8 x 1
1/8 x 3/8
3/32 x 1/4
BENEDEK 6356 b
(OUTLINE APPROX.)
RIBS 3/32
30 1/2
6
6 1/2
3
2 1/2
1 x 1 1/2
1/8 in SHEET TOP, BOTTOM & SIDES
1/8 PLY CENTER OUTLINE
1/2 SHEET SIDES
3 1/2
4 1/2
1/4 x 3/8
1/16 x 1/4
1/16 x 3/16
1/8 (?) x 3/8
"LUCIFER" FOLLOWS TREND BEGUN BY G. LEFEVER'S "ALTAIR"
SHOULD BE TOWED NOT TOO SLOW. NORMAL TRIM FOR WINDY WEATHER; FAIRLY TIGHT LEFT CIRCLE
DIMENSIONS FOR REFERENCE ONLY
SCALED FROM DWG IN "AEROMODELLER," JAN. 1957
1956 WORLD A/2 CHAMPIONSHIP
FLORENCE, ITALY
180, 180, 180, 180, 115. = 835
22
3 3/4
1956 NORDIC 2ND PLACE
BOB AMOR
ENGLAND
LUCIFER
F. Zaic

TOWING AIDS

by B. T. Faulkner — England

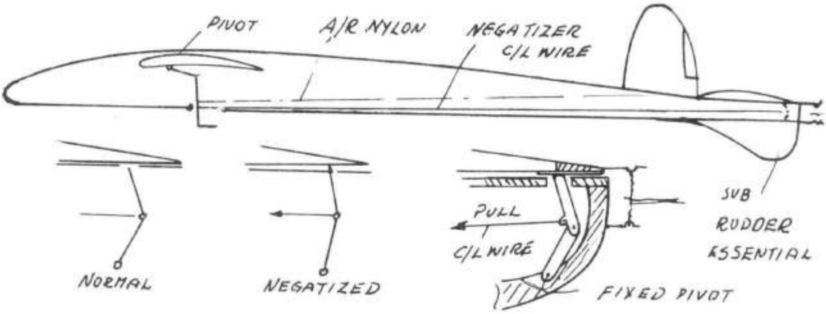
I cannot lay any claim to aeromodelling fame, because I am one of those "fly everything" type. I would get bored sticking to one type, and so I enter rubber, power or glider as the fancy strikes me. No radio or control line for me. About the only model I have that has placed high consistently is my 1 cc Payload, and I am enclosing a plan of this model. Nothing very unusual about it, except the goalpost mounted wings. This is to cut down on the fuselage cross section. The tail shape and tail construction is idea. It will not warp, and now I use no other.

Below is a glider tow hook which to me is tops. Think it out and you will see that under ALL conditions of tow the rudder is locked central. This is essential for thermal hunting. The traditional sliding or swinging trigger can edge back when model is VOH. Allied to this is the clockwork D.T. which I fitted to my "Mousetrap" A2. Tow all day if you like, and you get exactly 3 min. D/T, and no matches to strike, or crops on fire.

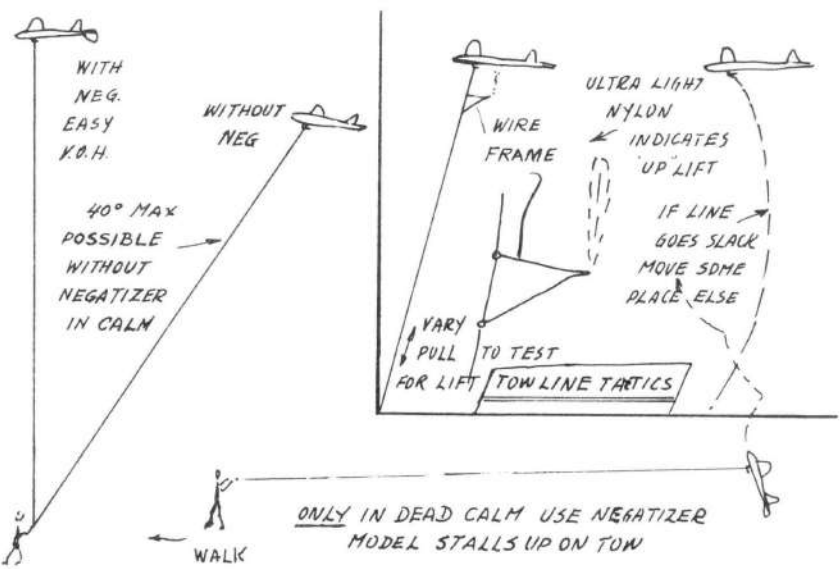


On the tow the Sorbo Rubber Pad interrupts the clockwork motor, i.e. impinges on the light balance wheel. On release of model at end of tow, the clockwork starts. Original timer is ex W/D and can be slowed down by soldering extra weight on the flywheel arms. Up to 4 min. possible.

Now for the real whizz. I call it the NEGATISER. Its use is for towing under dead calm weather, when you can run like blazes and nothing happens. Naturally, it has got kind of rusty with our gale force contests. But it is useful for towing up down wind (sounds funny, I know). This has an application when you run out of field and still have not hit any lift. With NEGATISER you just turn around and walk back.



Pull on tow line causes toggle to straighten up and thus lift stabilizer up 1/16 to 1/8 in. IMPORTANT; Auto Rudder must be centralised before NEGATISER begins to act, i.e., negatising cable is slack when Auto Rudder cable is tight.



About glider design: I will leave that for the experts. Suffice to say that any well-trimmed and well-built model can win if it gets the lift. Hence my work on the above gadgets which DO work. Do not get me wrong, I believe in developing the breed. But all things being equal, its the man on the rope that counts.

ANGLED TIP FINS FOR DIHEDRAL

by Bill Park —— A.P.O.

My attention was first called to the idea of using large angled tip-fins of flat section in place of tip dihedral in 1948, when the Sunnanvind glider kit was introduced to the British market. The model, of roughly present-day A/1 size, was designed by wing-section expert Sigurd Isaacson as a beginner's glider to be built in conjunction with a radio series given by the Royal Swedish Aero Club.

At the time, most of the gliders flown in Scotland were based on English designs, and were either of the lumbering, 1 lb. per square foot, theoretical type (and wouldn't fly worth a darn) or were out and out lightweights, with sparless, flimsy wings that broke the first day out. Only a few of us were flying medium-weight, tough ships of around 200-250 sq. in. wing area (influenced mainly by Peter Russell of Stirling and Peter Montgomery of Kirkaldy.)

To say that the Sunnanvind took the country by storm would be a mild understatement. At every contest there were more and more of them floating around, and with some reason, since the little beginner's model was more than a match for the best British designs of the time. Gradually some of the features, like the tip fins and the Isaacson sections, began to creep into other designs.

A follow-on design similar to the Sunnanvind appeared in the 1948 Aeromodeller Annual. This was the Hale, an intermediate contest model by Sven Ole Ridder. The most striking feature of the design was the absence of dihedral, apart from the flat section tips, which were angled at 70 degrees to the horizontal. This was about the same angle as used on the Sunnanvind, but the latter had dihedral on the centre panels. It was claimed that the Hale was very stable, but at the time we were rather suspicious.

After a while, interest in tip fins waned, to be revived from time to time by articles and photographs in the model magazines. Most development was done in Britain and Jugoslavia, with the accent in both cases on vertical tip fins. The British fliers used dihedral; the Jugoslavs did not. Nothing really new appeared, except the suggestion to extend the tip fins below the wing to provide vortex fences.

In 1955 I was looking for something out of the ordinary and easy to transport, and remembered the tip fins on the old Sunnanvind. It appeared that an A/2 wing with shallow V-dihedral and tip fins could easily be dismantled into our sections. It woud also be simpler to construction than a polyhedral wing. Due to lack of time, however, the plans were changed to have only the tip fins demountable, and later even this was abandoned. However, the final one-piece wing fitted quite comfortably into my Buick, so it did prove worthwhile. The model proved fine on stability and performance also.

My friend Jimmy Scarborough, of San Antonio, became interested in the ship (Tiki X) and built Tiki XI to my outlines, but changed the wing section and construction slightly, and used small end-plates while retaining the original dihedral on the centre-section. This last, as predicted, proved to his undoing. I tried towing it, and it was one of the most vicious models I've ever handled on the line.

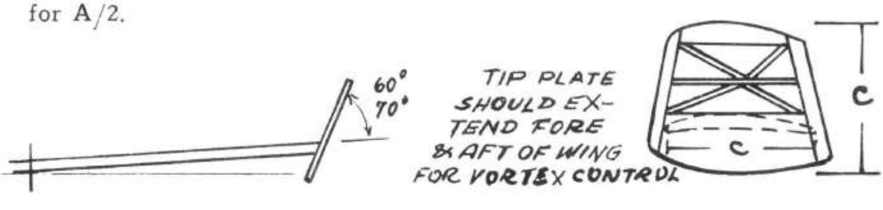
My Tiki didn't do so well either, for that matter. I had built an internal spring into the autorudder, and while it looked very neat, it just didn't have the power to hold the ship in a turn. On the first day of the Dallas FAI Eliminations, things went badly. However, on the morning of the second day, I modified the autorudder, and it began to look as if I still had a chance. While waiting for the wind to die off a little, I put the model under the front of the car for safety. You probably guess what happened: I moved the car, neatly chopping the port wing in two, so that was that.

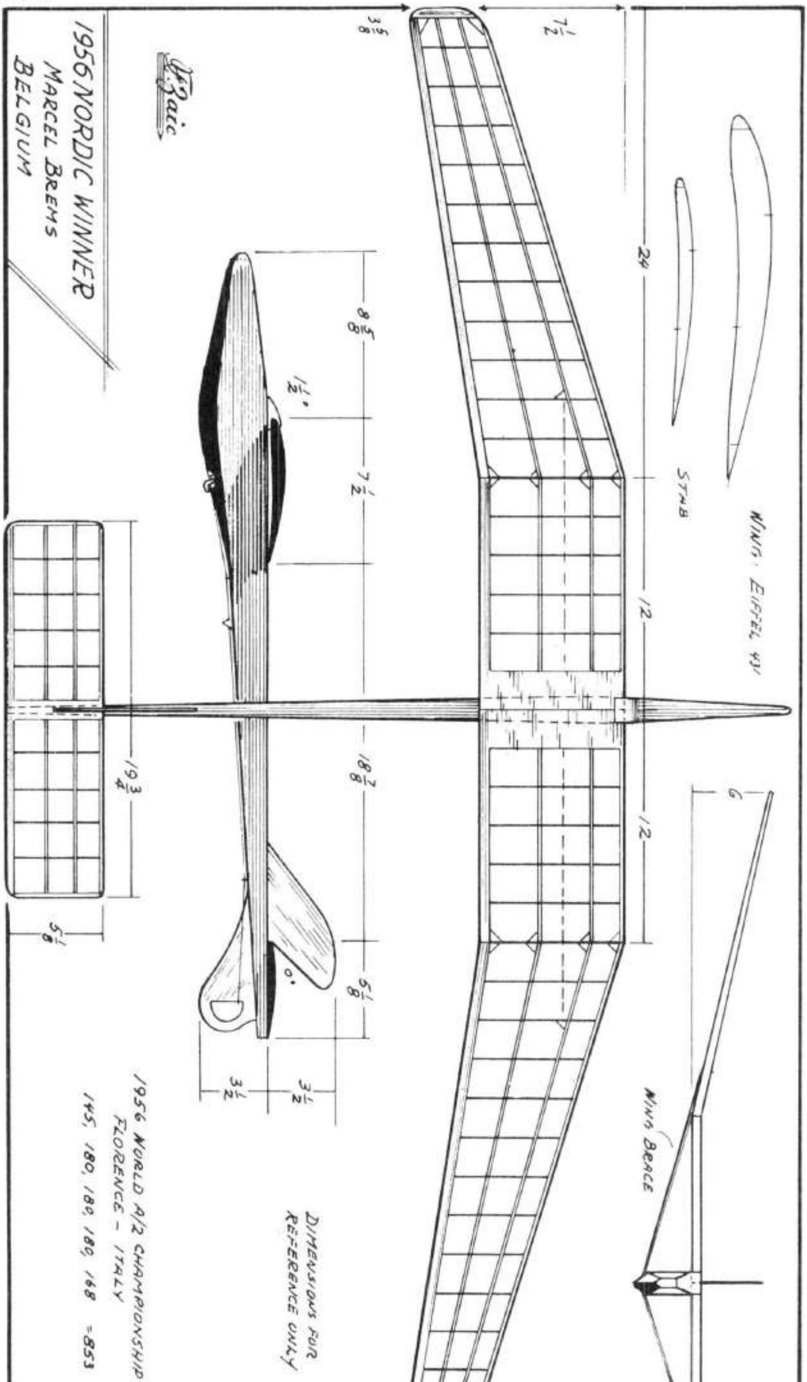
Later I decided to experiment with the pieces of the ship. One wing was still intact, so the port tip plate was stuck on what had been the centre rib, and the fuselage was shortened. The model was surprisingly good on tow (with offset hooks) and it began to seem that I had a potent AMA Class design, until it hung up in a high tree in Washington, D. C. and we couldn't retrieve it. It hung there for several weeks until someone climbed the tree and made off with the model.

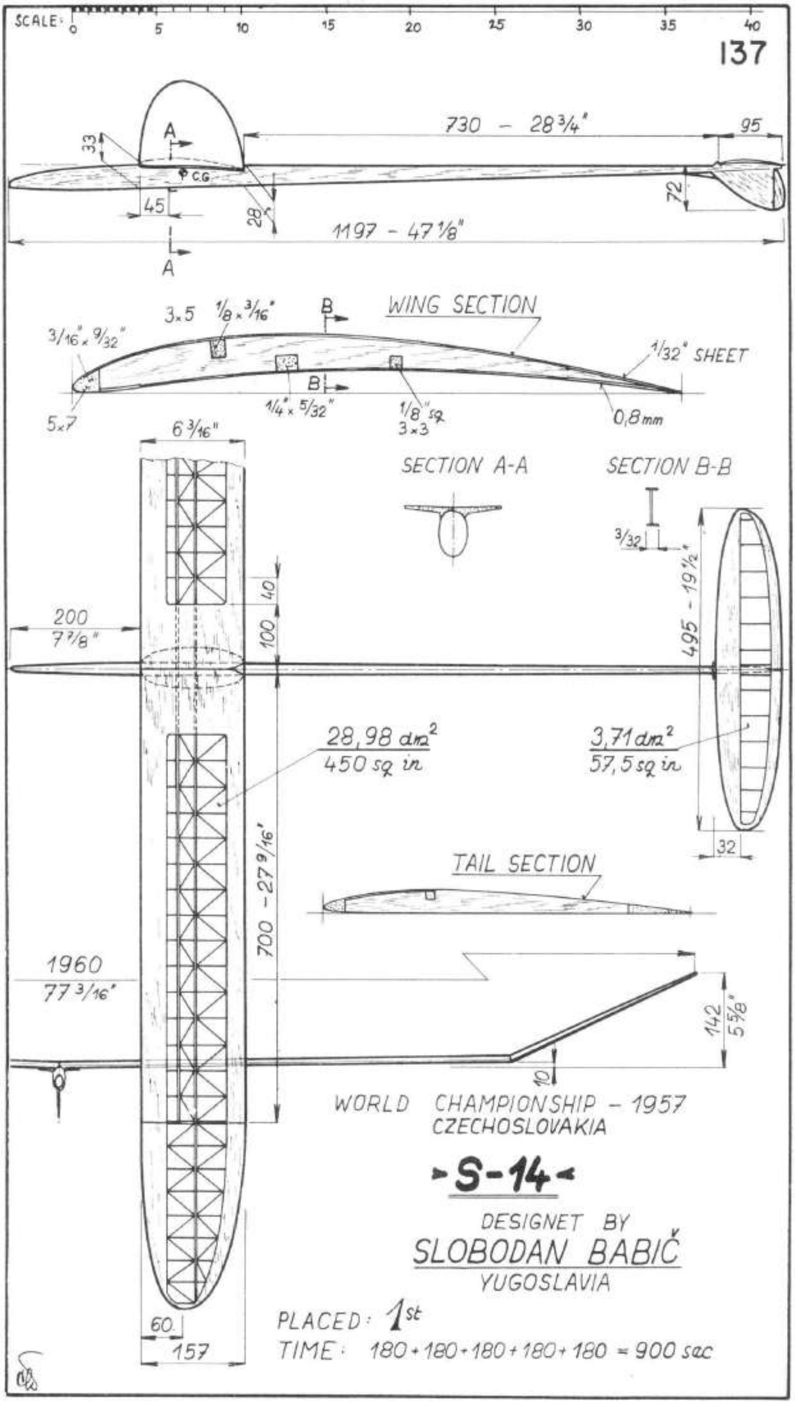
The conclusions I have drawn from all this haphazard experimenting are that "Dihedralled" tip plates provide good stability on: (1) dihedralled wings, both high and low A. R., even when the centre dihedral angle is small; (2) low A. R. undihedralled wings. (I have not tried a flat high A. R. wing.)

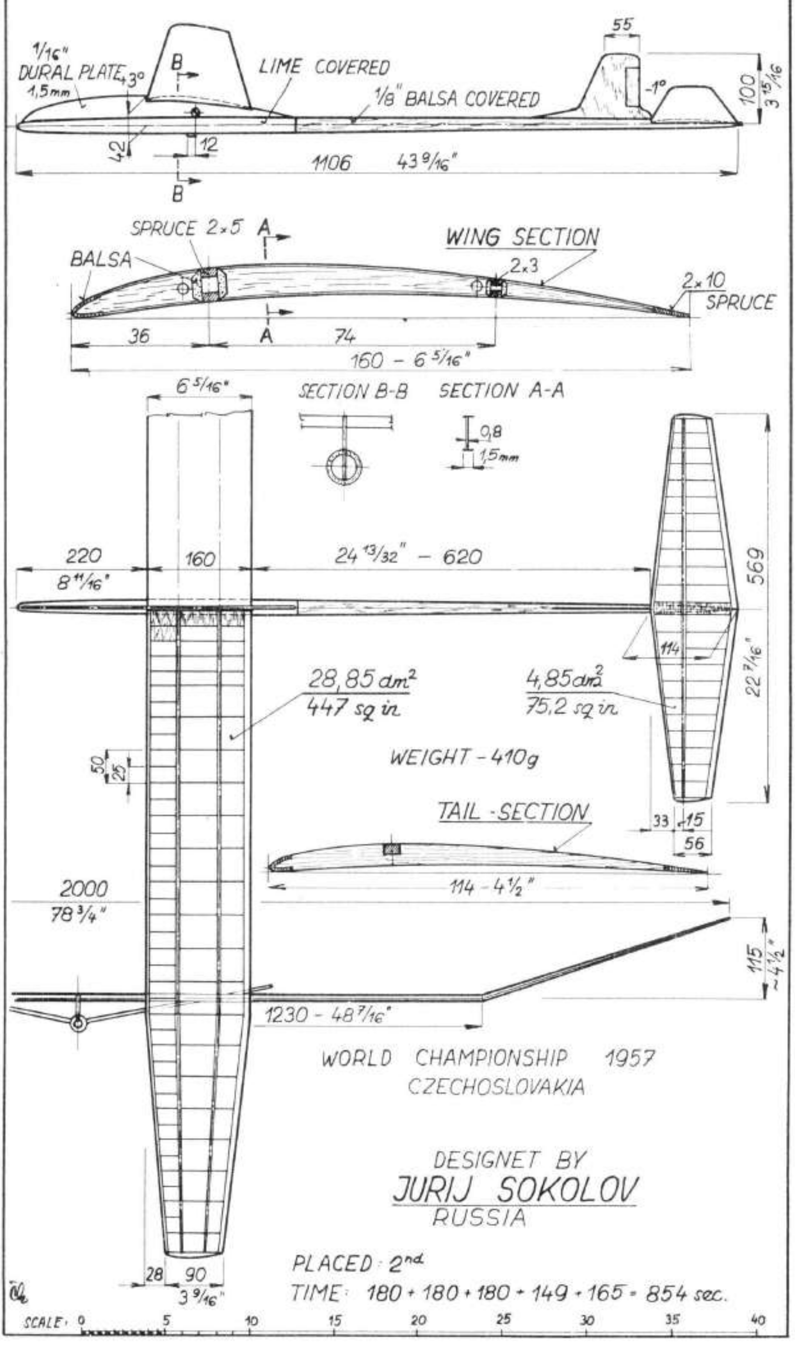
"Vertical" end-plates, no matter how large, do not appear to be adequate unless used in conjunction with appreciable centre dihedral, and, personally, can see no point in using them except as tip vortex minimisers.

Suggested size for tip plates is about one chord span, two-thirds of this being above the maximum camber point of the tip rib. Angle should be 60-70 degrees to the horizontal when the wing panel is laid flat. For small models, the tip could be made from soft 1/16 or 3/32 sheet, with grain spanwise and a stiffener added. Larger models require built-up construction to avoid too much weight at the tips—⅛ sheet outline with ⅛ sq. internal bracers in an X-pattern is fine for A/2.

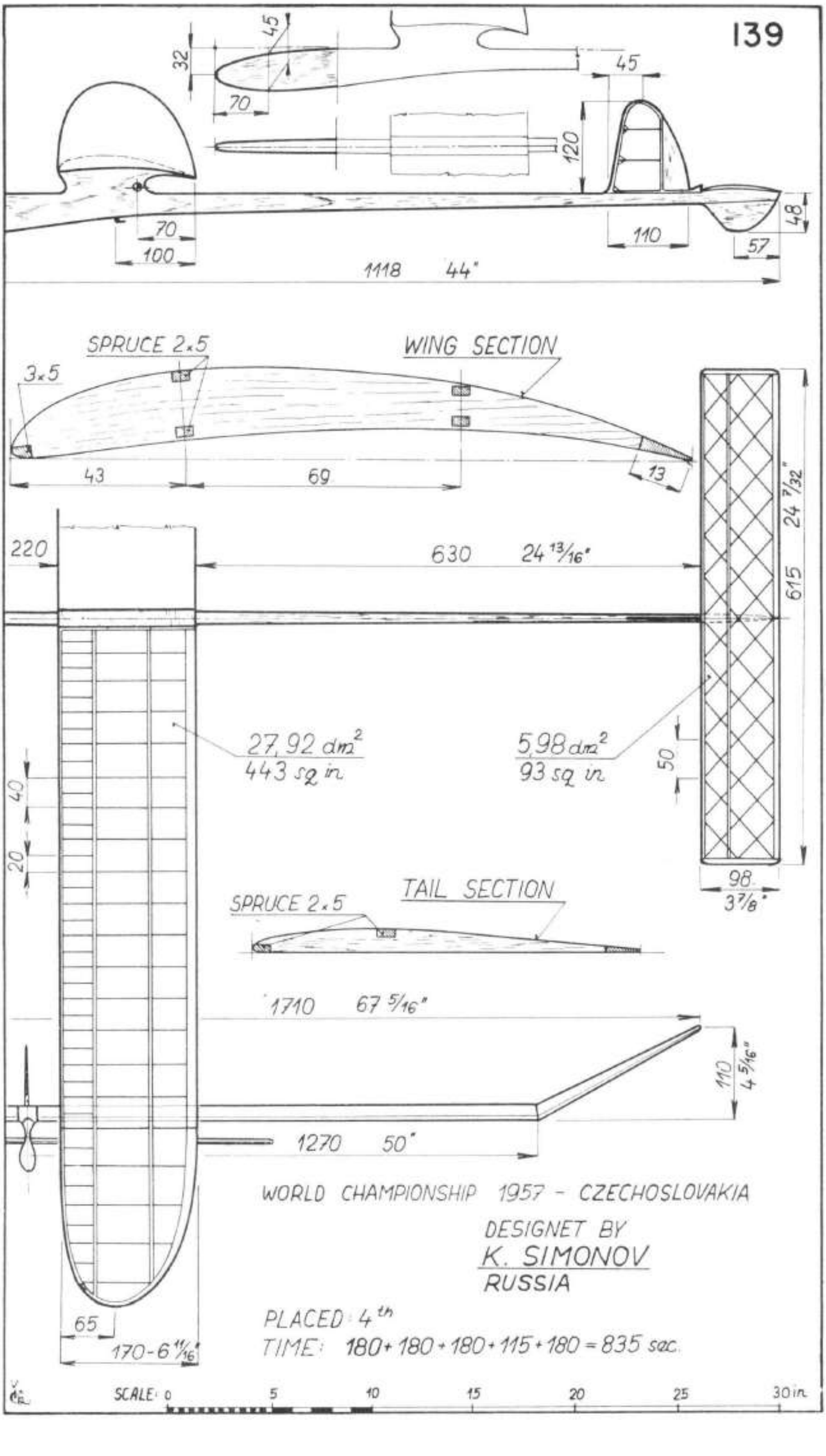


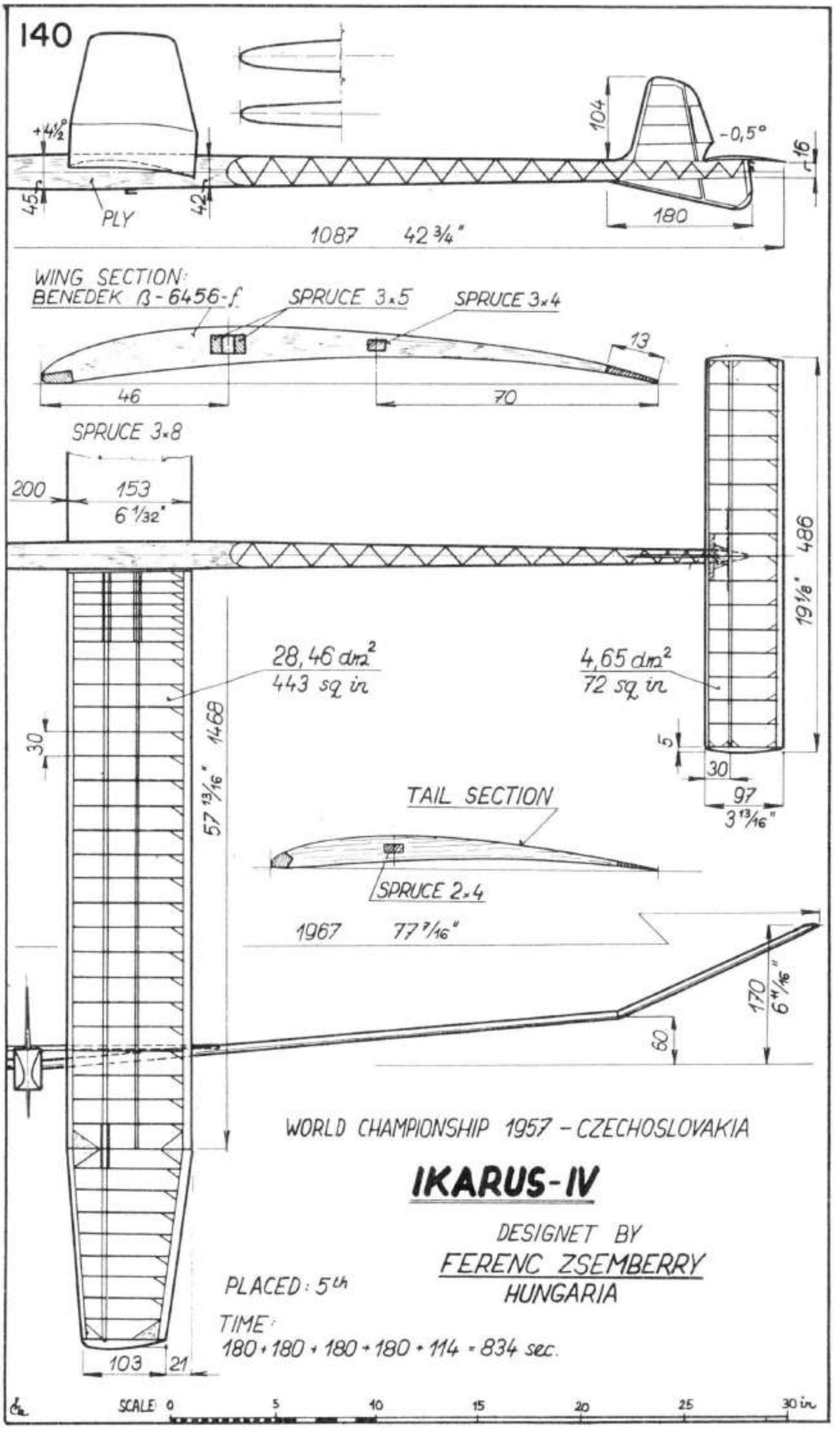

1956 NORDIC WINNER
MARCEL BREMS
BELGIUM
WING: EIFFEL 431
STAB
WING BRACE
DIMENSIONS FOR REFERENCE ONLY
1956 WORLD A/2 CHAMPIONSHIP
FLORENCE - ITALY
145, 180, 180, 180, 168 = 853

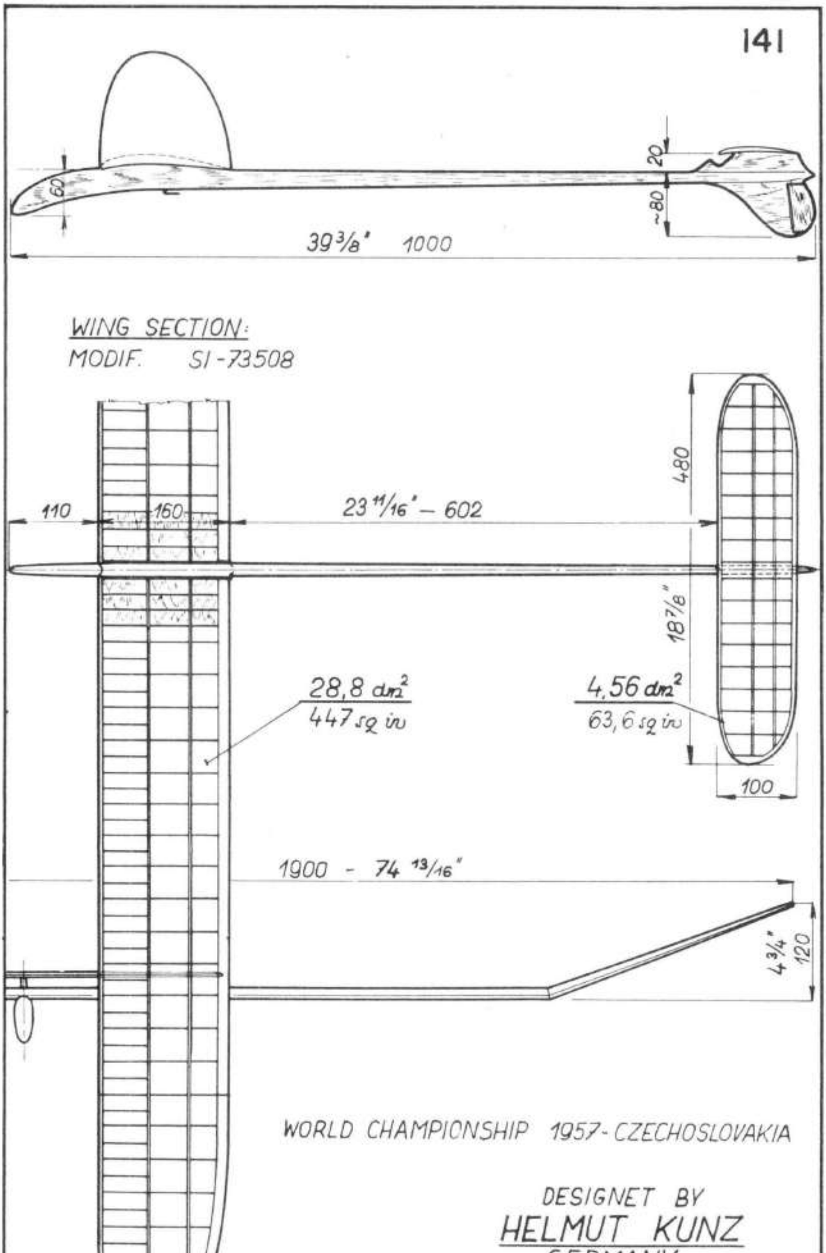

SCALE: 0 5 10 15 20 25 30 35 40
137
730 – 28 3/4"
95
33
A
C.G.
45
28°
72
1197 – 47 1/8"
A
WING SECTION
3x5
1/8 x 3/16"
B
3/16" x 9/32"
1/32" SHEET
B
5x7
1/4" x 5/32"
1/8" sq
3x3
0,8 mm
6 3/16"
SECTION A-A
SECTION B-B
3/32
495 – 19 1/2"
40
100
200
7 7/8"
28,98 dm²
450 sq in
3,71 dm²
57,5 sq in
32
700 – 27 9/16"
TAIL SECTION
1960
77 3/16"
142
5 5/8"
10
WORLD CHAMPIONSHIP – 1957
CZECHOSLOVAKIA
-S-14-
DESIGNET BY
SLOBODAN BABIČ
YUGOSLAVIA
PLACED: 1st
TIME: 180+180+180+180+180 = 900 sec
60
157

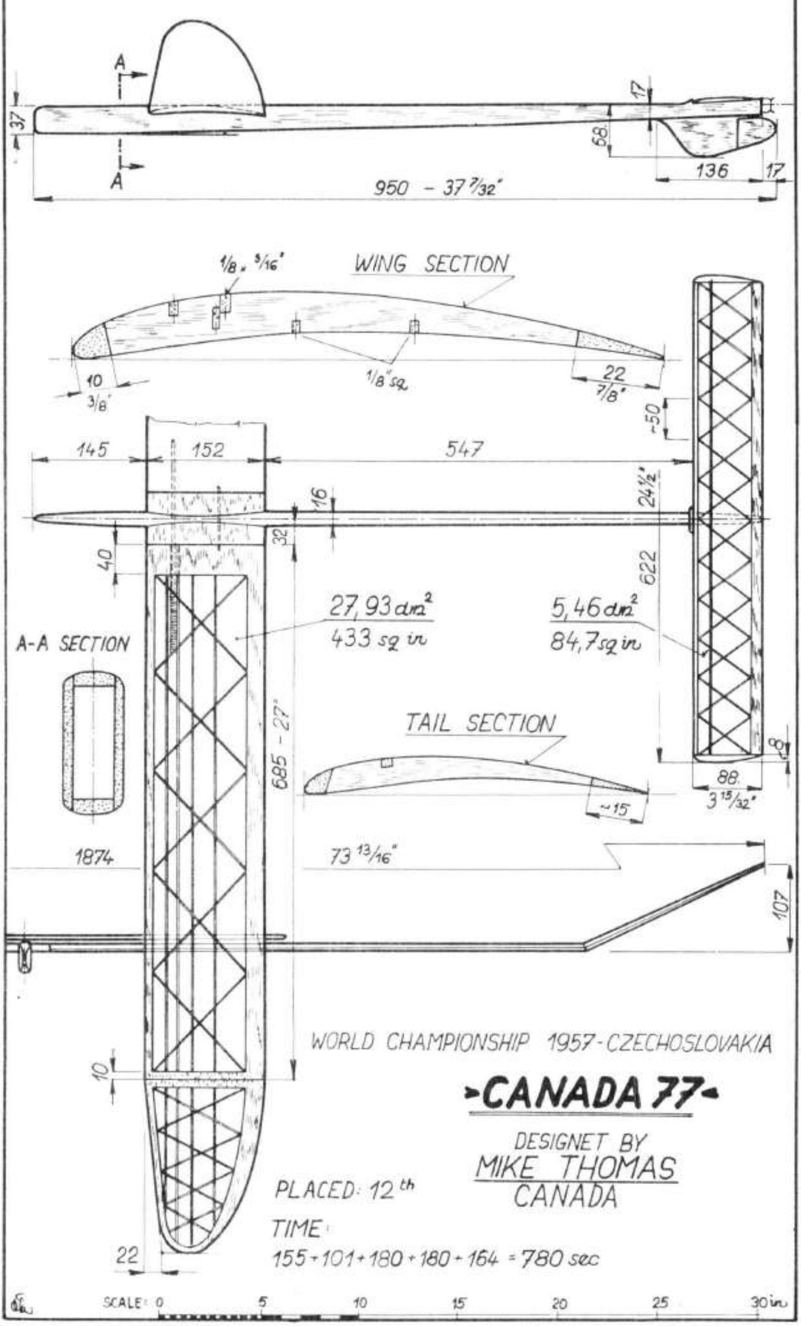


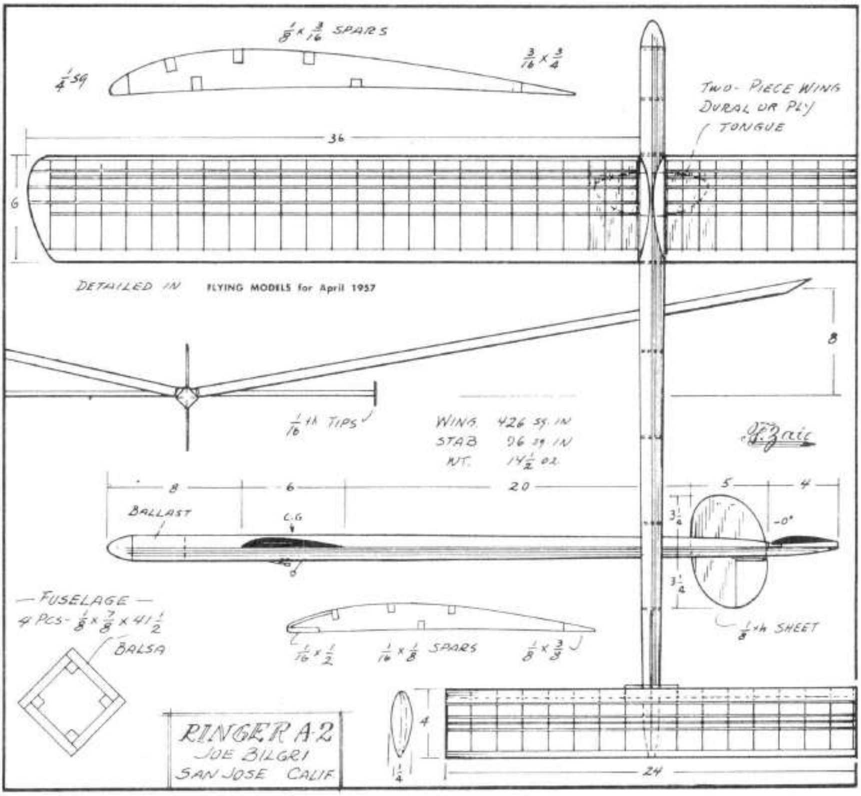
1/16" DURAL PLATE 1,5mm
3°
B
LIME COVERED
1/8" BALSA COVERED
55
-1°
100
3 15/16
42
12
1106 43 9/16"
B
SPRUCE 2×5
A
WING SECTION
BALSA
2×3
2×10 SPRUCE
36
A
74
160 - 6 5/16"
6 5/16"
SECTION B-B
SECTION A-A
0,8
1,5mm
220
8 11/16"
160
24 13/32" - 620
569
114
22 7/16"
28,85 dm²
447 sq in
4,85 dm²
75,2 sq in
50
25
WEIGHT - 410g
TAIL -SECTION
33
15
56
114 - 4 1/2"
2000
78 3/4"
115
~4 1/2"
1230 - 48 7/16"
WORLD CHAMPIONSHIP 1957
CZECHOSLOVAKIA
DESIGNET BY
JURIJ SOKOLOV
RUSSIA
PLACED: 2nd
TIME: 180 + 180 + 180 + 149 + 165 = 854 sec.
28
90
3 9/16"
SCALE: 0 5 10 15 20 25 30 35 40


139
45
32
70
45
120
70
100
110
48
57
1118 44"
SPRUCE 2×5
WING SECTION
3×5
43
69
13
24 7/32"
615
220
630 24 13/16"
27,92 dm²
443 sq in
5,98 dm²
93 sq in
50
40
20
98
3 7/8"
SPRUCE 2×5
TAIL SECTION
1710 67 5/16"
110
4 5/16"
1270 50"
WORLD CHAMPIONSHIP 1957 - CZECHOSLOVAKIA
DESIGNET BY
K. SIMONOV
RUSSIA
PLACED 4th
TIME: 180+180+180+115+180=835 sec.
65
170-6 11/16"
SCALE: 0 5 10 15 20 25 30 in.

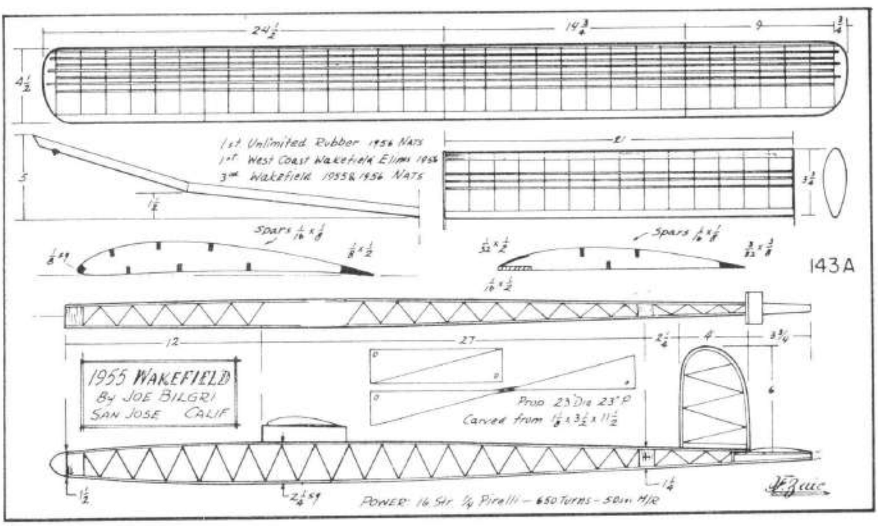

140
+4½°
45
PLY
42
104
-0,5°
16
180
1087 42 3/4"
WING SECTION:
BENEDEK B-6456-f
SPRUCE 3×5
SPRUCE 3×4
13
46
70
SPRUCE 3×8
200
153
6 1/32"
486
19 1/8"
28,46 dm²
443 sq in
4,65 dm²
72 sq in
30
1468
57 13/16"
5
30
97
3 13/16"
TAIL SECTION
SPRUCE 2×4
1967 77 7/16"
170
6 11/16"
60
WORLD CHAMPIONSHIP 1957 - CZECHOSLOVAKIA
IKARUS-IV
DESIGNET BY
FERENC ZSEMBERRY
HUNGARIA
PLACED: 5th
TIME:
180 + 180 + 180 + 180 + 114 = 834 sec.
103
21
SCALE: 0 5 10 15 20 25 30 in


20
60
~80
39 3/8" 1000
WING SECTION:
MODIF. SI-73508
110
160
23 11/16" – 602
480
18 7/8"
28,8 dm²
447 sq in
4,56 dm²
63,6 sq in
100
1900 - 74 13/16"
4 3/4"
120
WORLD CHAMPIONSHIP 1957-CZECHOSLOVAKIA
DESIGNET BY
HELMUT KUNZ
GERMANY
PLACED 7th
TIME
180 + 180 + 180 + 80 + 180 = 800 sec.
65
SCALE 0 5 10 15 20 25 30 in

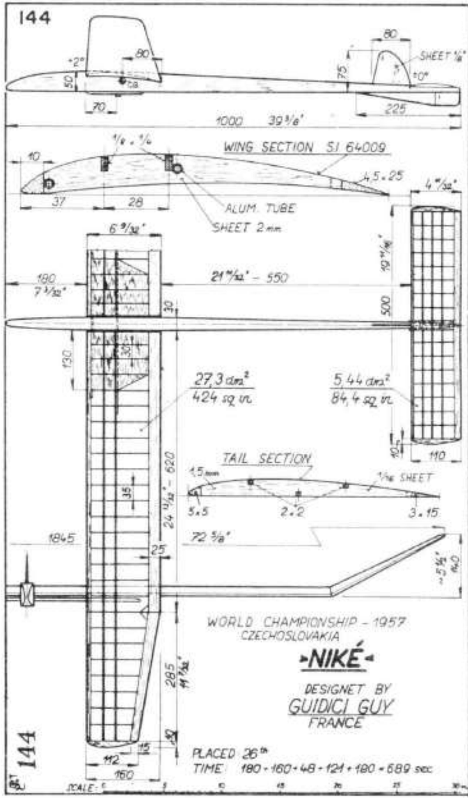

A
A
37
950 - 37 7/32"
17
68
136
17
1/8 x 3/16"
WING SECTION
10
3/8"
1/8" sq.
22
7/8"
145
152
547
~50
16
24 1/2"
32
40
622
27,93 dm²
433 sq in
5,46 dm²
84,7 sq in
A-A SECTION
685 - 27"
TAIL SECTION
8
88
3 15/32"
~15
1874
73 13/16"
107
WORLD CHAMPIONSHIP 1957 - CZECHOSLOVAKIA
10
-CANADA 77-
DESIGNET BY
MIKE THOMAS
CANADA
PLACED: 12 th
TIME:
155 + 101 + 180 + 180 + 164 = 780 sec
22
SCALE: 0
5
10
15
20
25
30 in

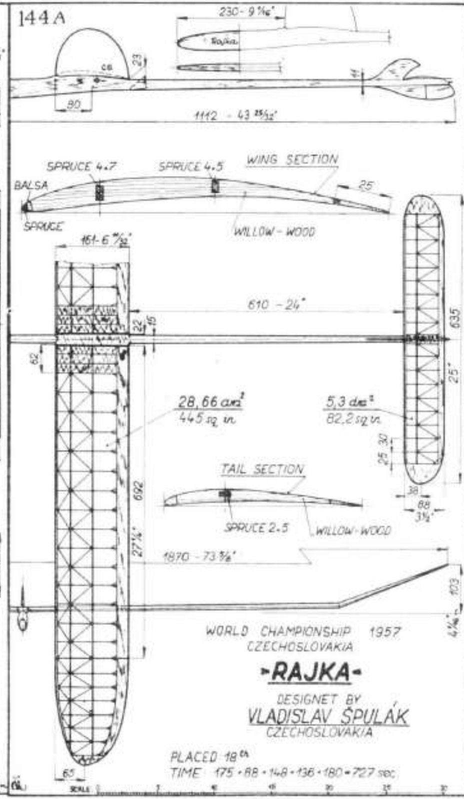


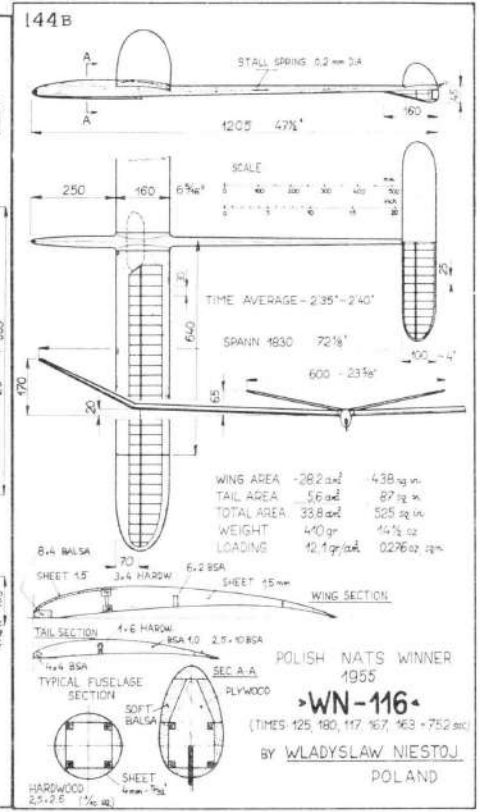
1/8 x 3/16 SPARS
1/4 SQ
3/16 x 3/4
TWO-PIECE WING
DURAL OR PLY
TONGUE
36
6
DETAILED IN FLYING MODELS for April 1957
8
1/16 th TIPS
WING 426 sq. IN
STAB 96 sq. IN
WT. 14 1/2 OZ.
8
6
20
5
4
BALLAST
C.G
3 1/4
-0°
3 1/4
— FUSELAGE —
4 PCS - 1/8 x 7/8 x 41 1/2
BALSA
1/16 x 1/2
1/16 x 1/8 SPARS
1/8 x 3/8
1/8 th SHEET
RINGER A-2
JOE BILGRI
SAN JOSE CALIF.
4
1 1/4
24

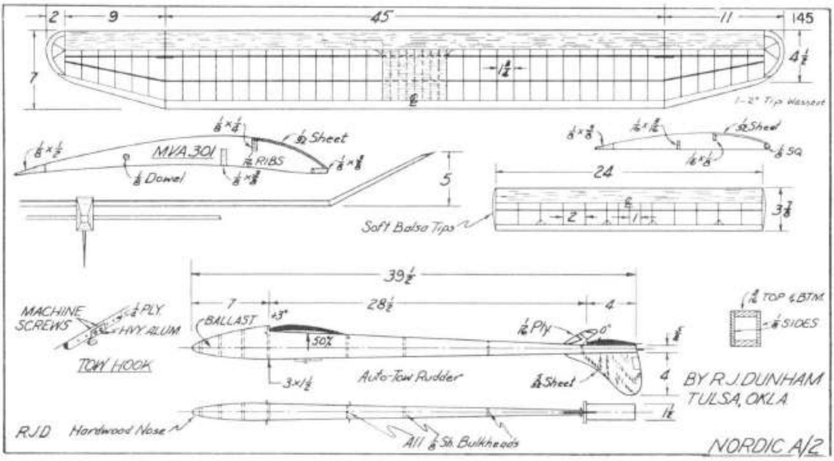


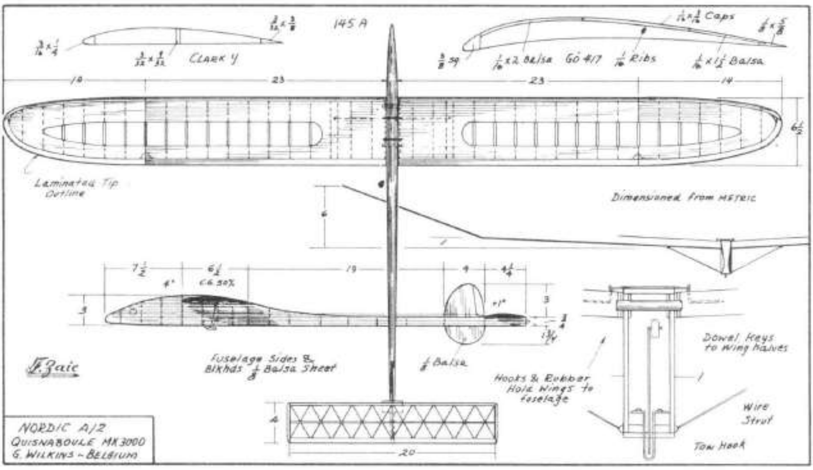
24 1/2
14 3/4
9
3/4
4 1/2
1st Unlimited Rubber 1956 Nats
1st West Coast Wakefield Elims 1956
3rd Wakefield 1955 & 1956 Nats
21
5
1 1/2
3 3/4
Spars 1/16 x 1/8
1/8 sq
1/8 x 1/2
1/32 x 1/2
Spars 1/16 x 1/8
3/32 x 3/8
1/16 x 1/2
143A
12
27
2 1/4
4
3 3/4
1955 WAKEFIELD
By JOE BILGRI
SAN JOSE CALIF
Prop 23 Dia 23 P
Carved from 1 1/8 x 3 1/2 x 11 1/2
6
1 1/2
2 1/4 sq
1 1/4
POWER: 16 Str. 1/4 Pirelli — 650 Turns — 50in M/R

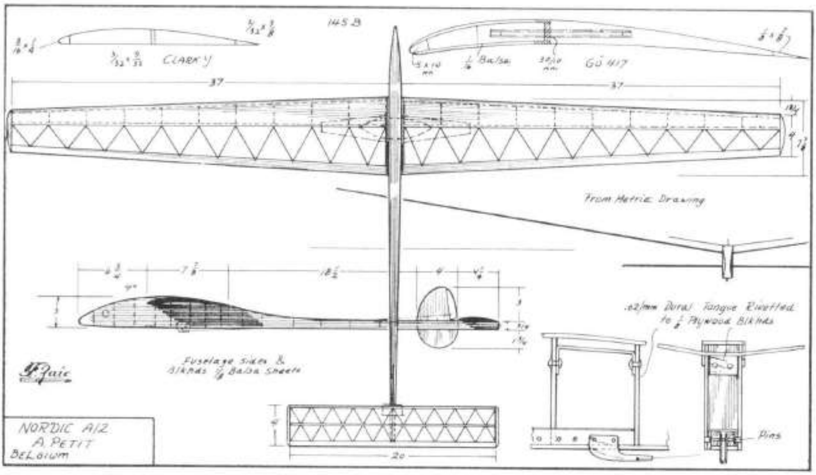

144
WING SECTION SI 64009
ALUM. TUBE
SHEET 2 mm
TAIL SECTION
27,3 dm²
424 sq in
5,44 dm²
84,4 sq in
WORLD CHAMPIONSHIP - 1957
CZECHOSLOVAKIA
»NIKÉ«
DESIGNET BY
GUIDICI GUY
FRANCE
PLACED 26th
TIME 180 + 160 + 48 + 121 + 180 = 689 sec

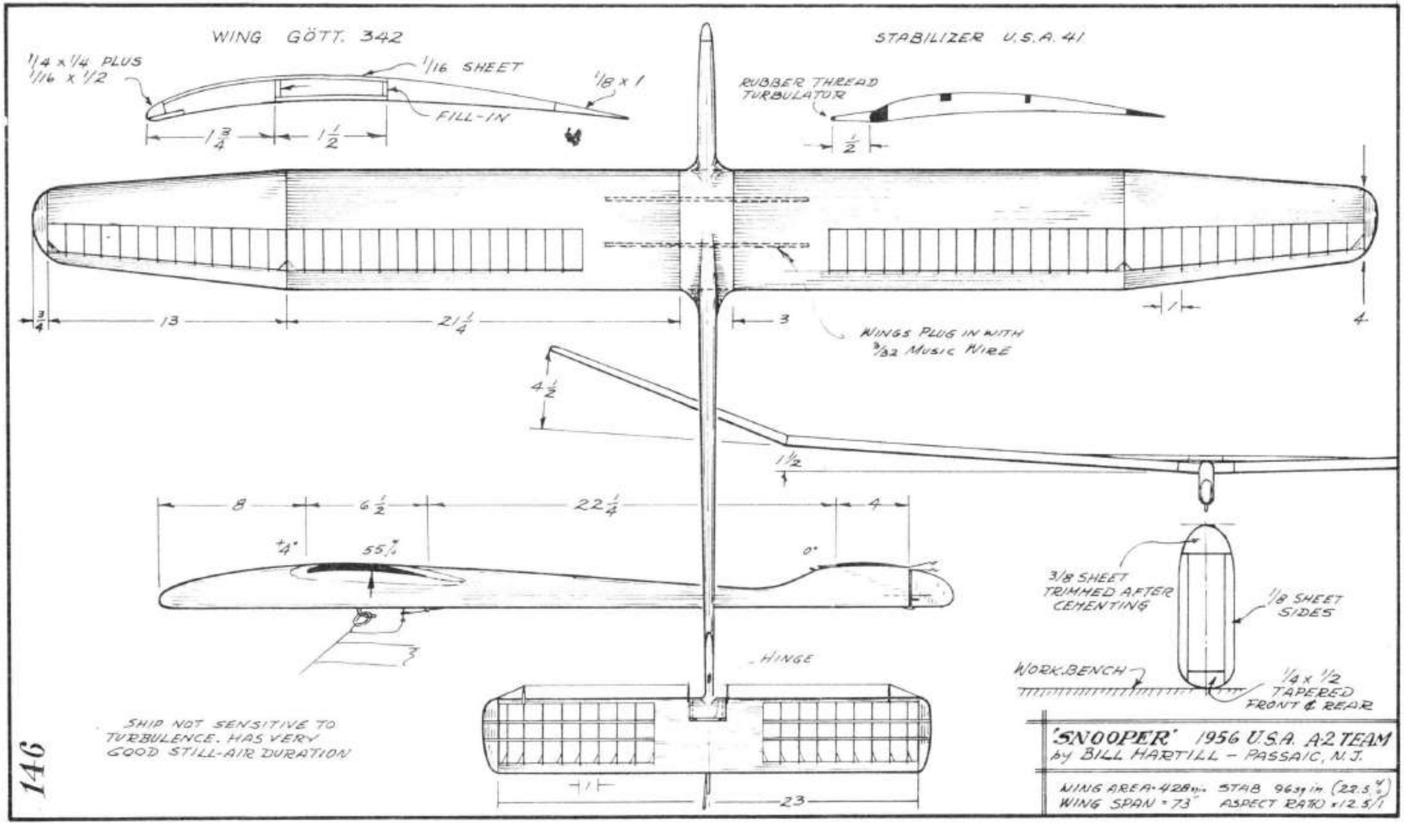

144 A
SPRUCE 4.7
SPRUCE 4.5
WING SECTION
BALSA
SPRUCE
WILLOW - WOOD
28,66 dm²
445 sq in
5,3 dm²
82,2 sq in
TAIL SECTION
SPRUCE 2.5
WILLOW - WOOD
WORLD CHAMPIONSHIP 1957
CZECHOSLOVAKIA
»RAJKA«
DESIGNET BY
VLADISLAV ŠPULÁK
CZECHOSLOVAKIA
PLACED 18th
TIME 175 + 88 + 148 + 136 + 180 = 727 sec

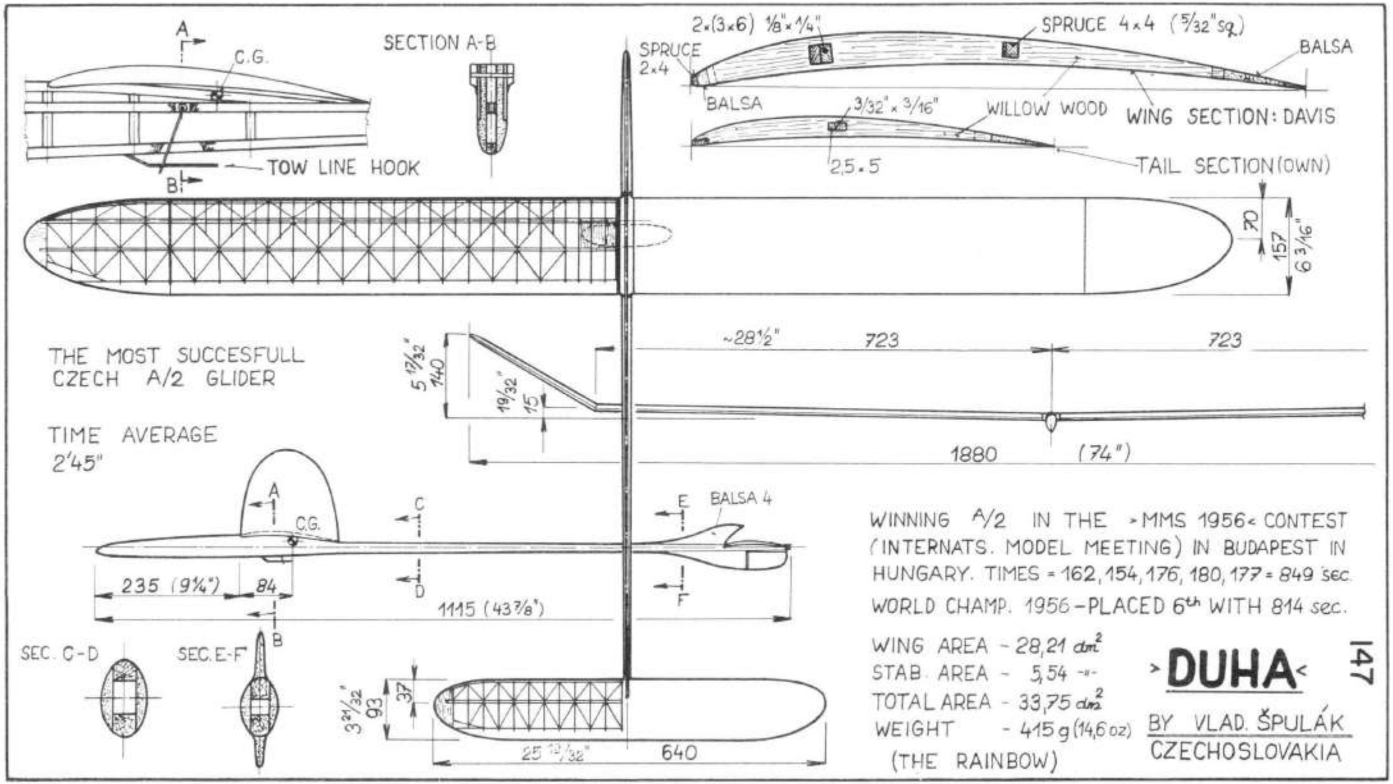

144 B
STALL SPRING 0,2 mm DIA
SCALE
TIME AVERAGE - 2'35" - 2'40"
SPANN 1830 72⅛"
WING AREA 28,2 dm² 438 sq in
TAIL AREA 5,6 dm² 87 sq in
TOTAL AREA 33,8 dm² 525 sq in
WEIGHT 410 gr 14½ oz
LOADING 12,1 gr/dm² 0,276 oz sq in
WING SECTION
TAIL SECTION
TYPICAL FUSELAGE SECTION
SEC A-A
PLYWOOD
SOFT BALSA
HARDWOOD
POLISH NATS WINNER
1955
»WN-116«
(TIMES 125, 180, 117, 167, 163 = 752 sec)
BY WLADYSLAW NIESTOJ
POLAND

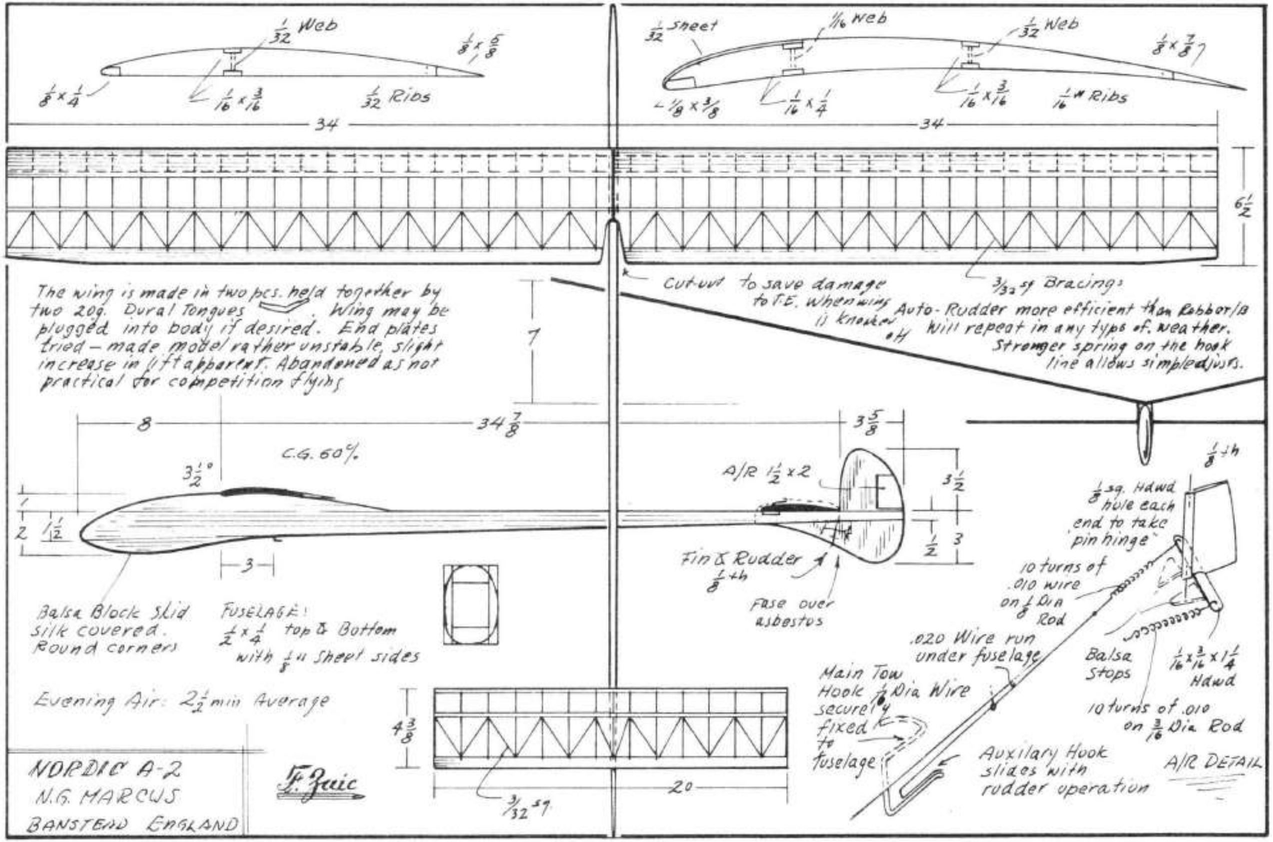

145
MVA 301
Dowel
RIBS
Sheet
Soft Balsa Tips
MACHINE SCREWS
PLY.
HVY. ALUM.
TOW HOOK
BALLAST
50%
Auto-Tow Rudder
Sheet
TOP & BTM.
SIDES
BY R.J. DUNHAM
TULSA, OKLA.
RJD
Hardwood Nose
Bulkheads
NORDIC A/2


145 A
CLARK Y
Balsa
GÖ 417
Ribs
Caps
Laminated Tip Outline
Dimensioned from METRIC
Fuselage Sides & Blkhds Balsa Sheet
Balsa
Hooks & Rubber Hold Wings to Fuselage
Dowel Keys to Wing halves
Wire Strut
Tow Hook
F. Zaic
NORDIC A/2
QUISNABOULE MK 3000
G. WILKINS – BELGIUM

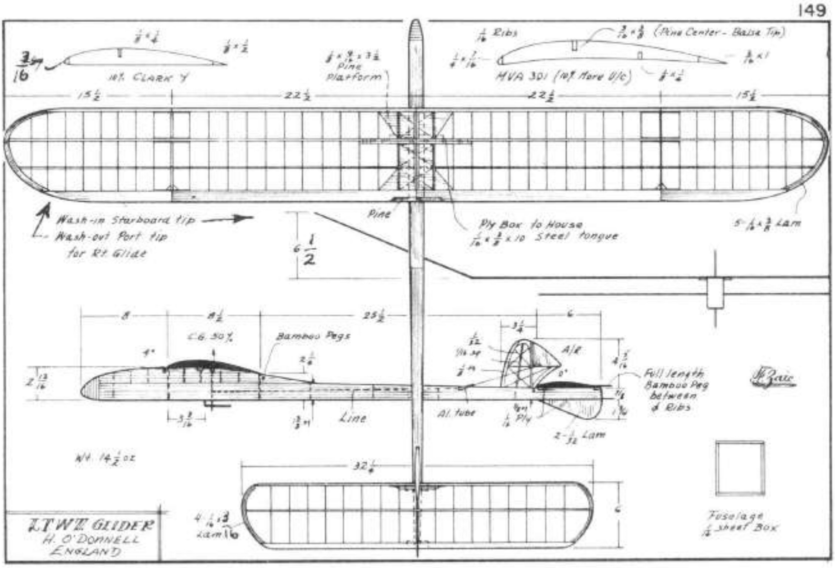

145 B
CLARK Y
Balsa
GÖ 417
From Metric Drawing
Fuselage Sides & Blkhds Balsa Sheets
Dural Tongue Rivetted to Plywood Blkhds
Pins
F. Zaic
NORDIC A/2
A. PETIT
BELGIUM


WING GÖTT. 342
1/4 x 1/4 PLUS 1/16 x 1/2
1/16 SHEET
1/8 x 1
FILL-IN
STABILIZER U.S.A. 41
RUBBER THREAD TURBULATOR
WINGS PLUG IN WITH 3/32 MUSIC WIRE
HINGE
3/8 SHEET TRIMMED AFTER CEMENTING
1/8 SHEET SIDES
WORK BENCH
1/4 x 1/2 TAPERED FRONT & REAR
SHIP NOT SENSITIVE TO TURBULENCE. HAS VERY GOOD STILL-AIR DURATION
'SNOOPER' 1956 U.S.A. A-2 TEAM
by BILL HARTILL – PASSAIC, N.J.
WING AREA - 428 sq. in. STAB 96 sq. in. (22.5 %)
WING SPAN = 73" ASPECT RATIO = 12.5/1

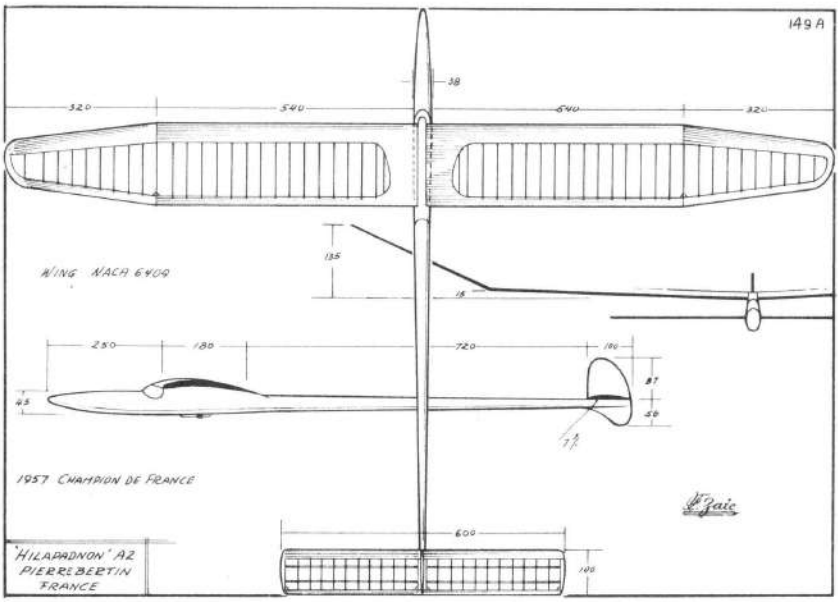

SECTION A-B
C.G.
TOW LINE HOOK
2×(3×6) 1/8"×1/4"
SPRUCE 4×4 (5/32" sq.)
SPRUCE 2×4
BALSA
BALSA
3/32"×3/16"
WILLOW WOOD
WING SECTION: DAVIS
2,5×5
TAIL SECTION (OWN)
70
157
6 3/16"
THE MOST SUCCESFULL CZECH A/2 GLIDER
TIME AVERAGE 2'45"
5 17/32"
140
19/32"
15
~28½"
723
723
1880
(74")
BALSA 4
WINNING A/2 IN THE »MMS 1956« CONTEST (INTERNATS. MODEL MEETING) IN BUDAPEST IN HUNGARY. TIMES = 162, 154, 176, 180, 177 = 849 sec.
WORLD CHAMP. 1956 – PLACED 6th WITH 814 sec.
235 (9¼")
84
1115 (43 7/8")
SEC. C-D
SEC. E-F
3 21/32"
93
37
25 13/32"
640
WING AREA – 28,21 dm²
STAB. AREA – 5,54 -"-
TOTAL AREA – 33,75 dm²
WEIGHT – 415 g (14,6 oz)
(THE RAINBOW)
»DUHA«
BY VLAD. ŠPULÁK
CZECHOSLOVAKIA
147



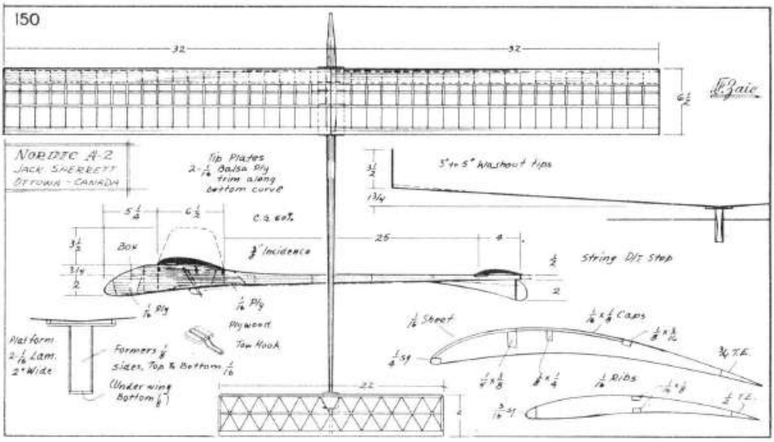
1/32 Web
1/8 x 5/8
1/8 x 1/4
1/16 x 3/16
1/32 Ribs
1/32 Sheet
1/16 Web
1/32 Web
1/8 x 7/8
1/8 x 3/8
1/16 x 1/4
1/16 x 3/16
1/16" Ribs
34
34
6 1/2
The wing is made in two pcs. held together by two 20g. Dural Tongues. Wing may be plugged into body if desired. End plates tried – made model rather unstable, slight increase in lift apparent. Abandoned as not practical for competition flying
Cut-out to save damage to T.E. when wing is knocked off
3/32 sq Bracings
Auto-Rudder more efficient than Rubber/B
Will repeat in any type of weather.
Stronger spring on the hook line allows simple adjusts.
7
8
34 7/8
3 5/8
C.G. 60%.
3 1/2°
A/R 1 1/2 x 2
3 1/2
2
1 1/2
1/2
3
3
Fin & Rudder 1/8 th
Fuse over asbestos
Balsa Block Skid silk covered. Round corners
FUSELAGE: 1/2 x 1/4 top & Bottom with 1/8" Sheet sides
Evening Air: 2 1/2 min Average
4 3/8
3/32 sq
20
1/8 th
1/8 sq. Hdwd hole each end to take "pin hinge"
10 turns of .010 wire on 1/8 Dia Rod
.020 Wire run under fuselage
Balsa Stops
1/16 x 3/16 x 1 1/4 Hdwd
Main Tow Hook 1/16 Dia Wire securely fixed to fuselage
10 turns of .010 on 3/16 Dia Rod
Auxilary Hook slides with rudder operation
A/R DETAIL
NORDIC A-2
N.G. MARCUS
BANSTEAD ENGLAND

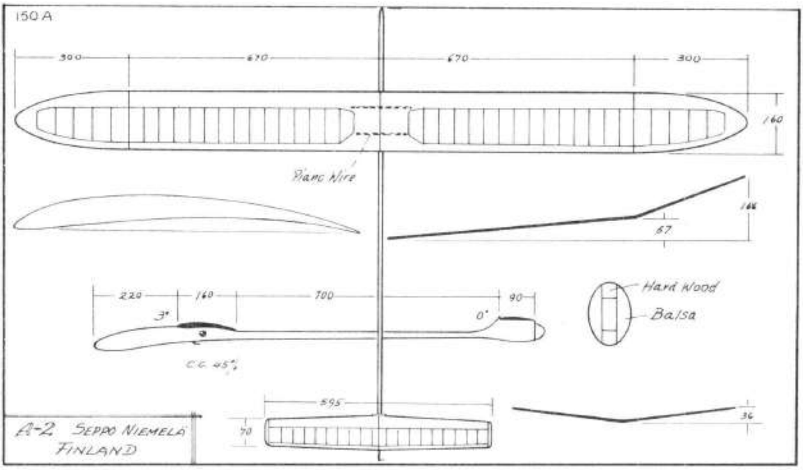


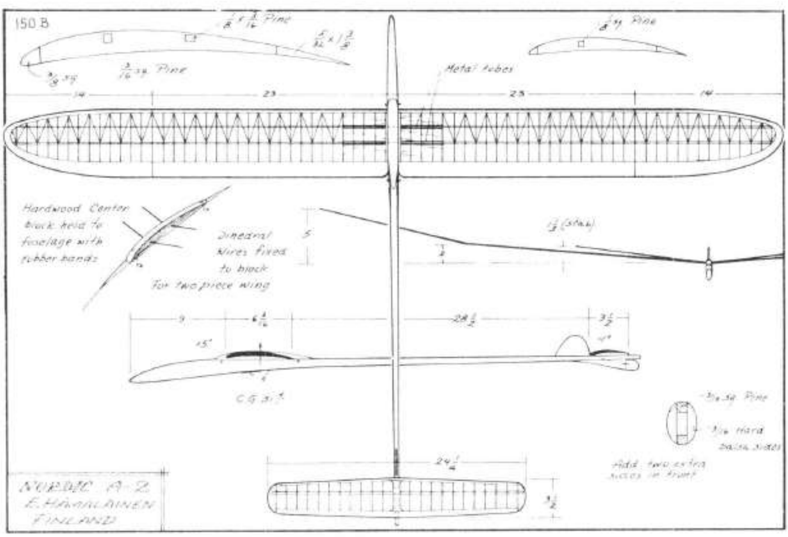
10% CLARK Y
Pine Platform
1/16 Ribs
(Pine Center - Balsa Tip)
MVA 301 (10% More U/C)
15 1/2
22 1/2
22 1/2
15 1/2
Wash-in Starboard tip
Wash-out Port tip
for Rt. Glide
Pine
Ply Box to House
Steel tongue
Lam
6 1/2
8
8 1/2
25 1/2
C.G. 50%
Bamboo Pegs
A/R
Full length
Bamboo Peg
between
Ribs
Line
Al. tube
Ply
Lam
Wt. 14 1/2 oz
32 1/4
Fusolage
sheet Box
LTW II GLIDER
H. O'DONNELL
ENGLAND

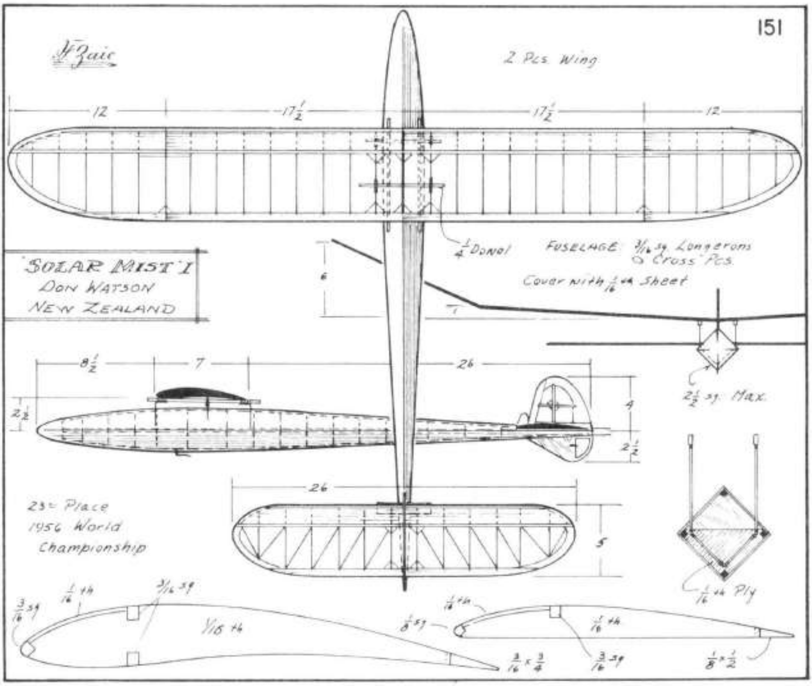


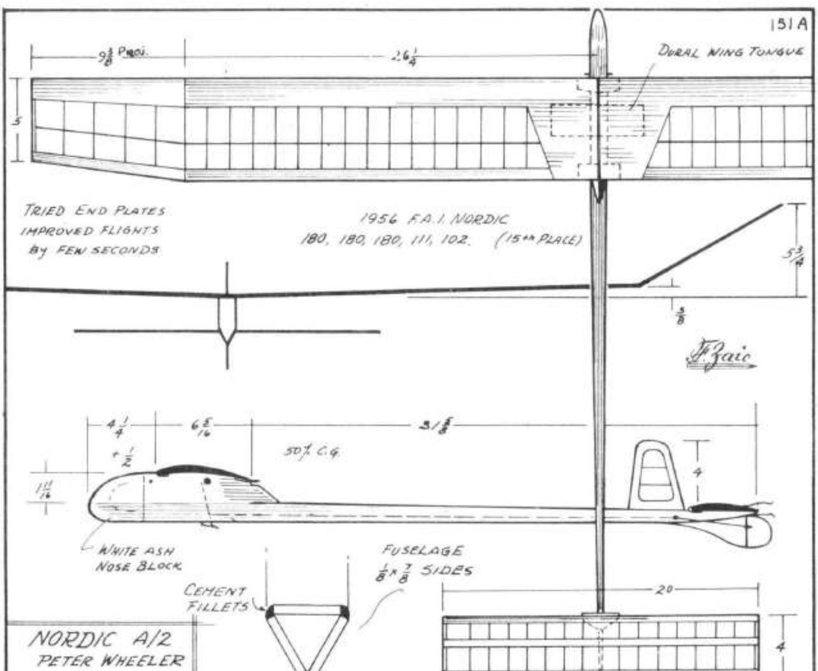
149 A
38
320
540
540
320
135
WING NACA 6409
250
180
720
100
45
87
56
1957 CHAMPION DE FRANCE
600
100
'HILAPADNON' A2
PIERREBERTIN
FRANCE

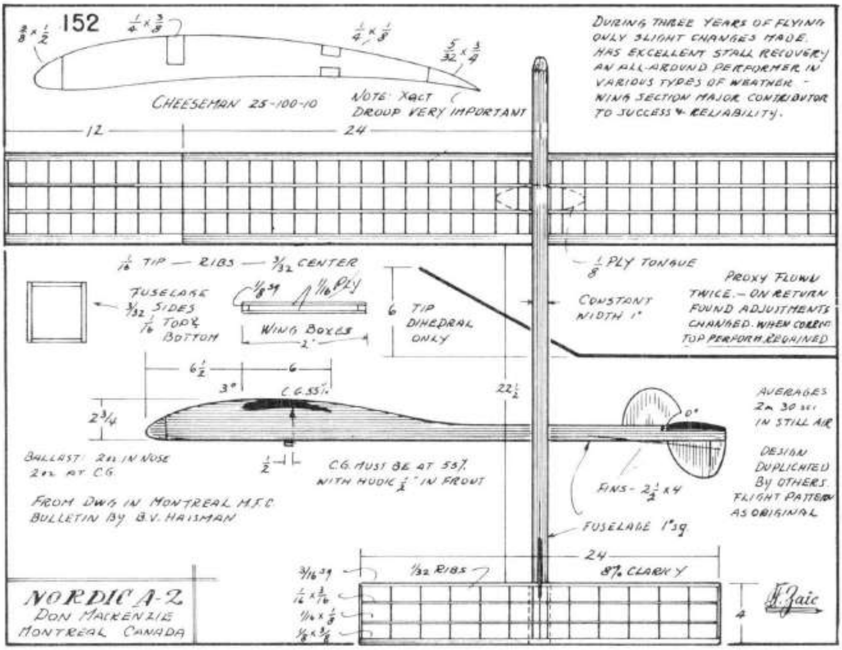

150
32
32
6 1/2
NORDIC A-2
JACK SHERRETT
OTTOWA - CANADA
Tip Plates
2-1/16 Balsa Ply
trim along
bottom curve
3" to 5" Washout tips
5 1/4
6 1/2
C.G. 60%
3 1/2
Box
3° Incidence
25
4
1/2
String D/T Stop
1/16 Ply
1/16 Ply
Plywood
Tow Hook
1/16 Sheet
1/16 x 1/4 Caps
Platform
2-1/16 Lam.
2" Wide
Formers 1/8
sides, Top & Bottom 1/16
(Under wing
Bottom 1/8)
22
1/16 Ribs
3/16 T.E.
1/8 T.E.


150 A
300
670
670
300
160
Piano Wire
166
67
220
160
700
90
3°
0°
Hard Wood
Balsa
C.G. 45%
595
70
36
A-2 SEPPO NIEMELÄ
FINLAND

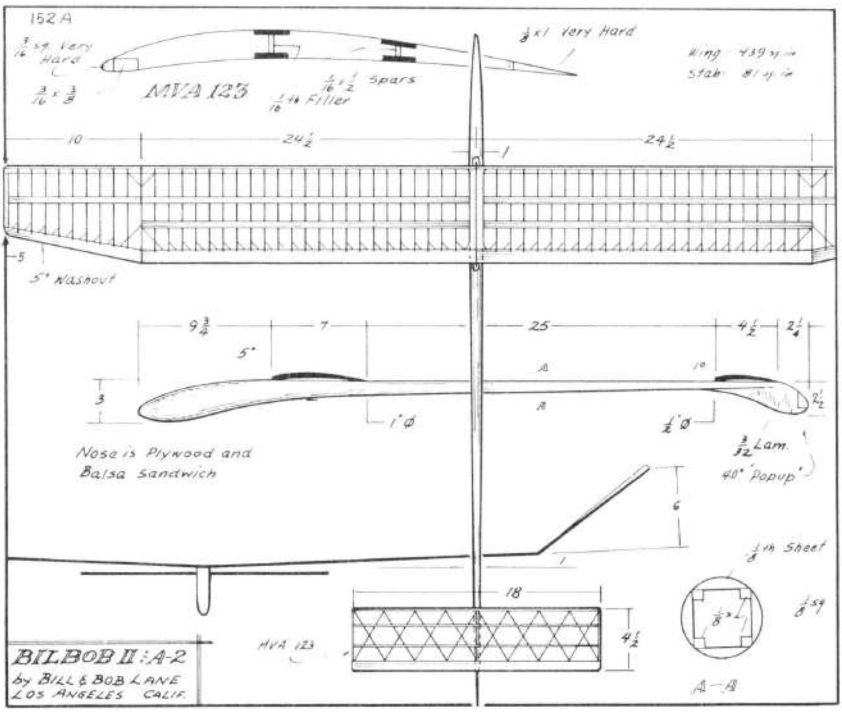

150 B
Pine
Pine
Metal tubes
14
23
23
14
Hardwood Center
block held to
fuselage with
rubber bands
Dihedral
Wires fixed
to block
For two piece wing
5
9
28 1/2
3 1/2
C.G.
Pine
Hard
Balsa sides
Add two extra
sides in front
24 1/4
NORDIC A-2
E. HAMALAINEN
FINLAND


151
F. Zaic
2 Pcs. Wing
12
17 1/2
17 1/2
12
1/4 Dowel
FUSELAGE: 3/16 sq. Longerons & Cross Pcs.
Cover with 1/16 th Sheet
"SOLAR MIST I"
DON WATSON
NEW ZEALAND
6
8 1/2
7
26
2 1/2
4
2 1/2
2 1/2 sq. Max.
26
5
23rd Place
1956 World
Championship
1/16 th Ply
3/16 sq.
1/16 th
3/16 sq
1/16 th
1/16 th
1/8 sq
1/16 th
3/16 x 3/4
3/16 sq
1/8 x 1/2

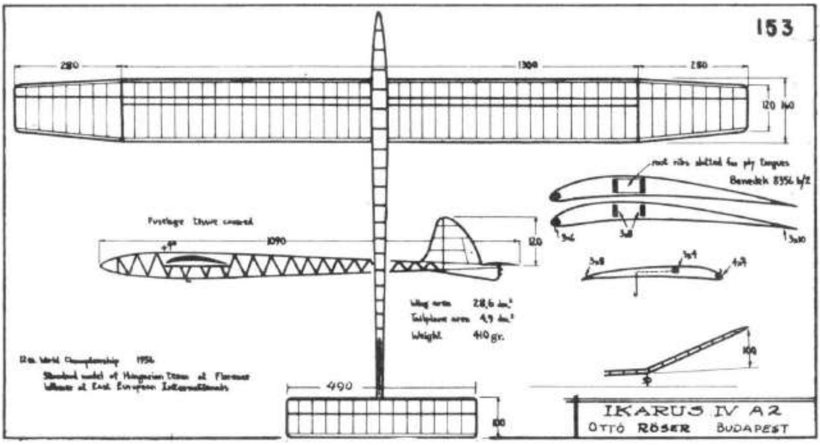

151A
9 3/8 Proj.
26 1/4
DURAL WING TONGUE
5
TRIED END PLATES
IMPROVED FLIGHTS
BY FEW SECONDS
1956 F.A.I. NORDIC
180, 180, 180, 111, 102. (15th PLACE)
5 3/4
5/8
F. Zaic
4 1/4
6 5/16
31 5/8
+ 1/2
50% C.G.
1 11/16
4
WHITE ASH
NOSE BLOCK
FUSELAGE
1/8 x 7/8 SIDES
CEMENT
FILLETS
20
4
NORDIC A/2
PETER WHEELER
NEW ZEALAND

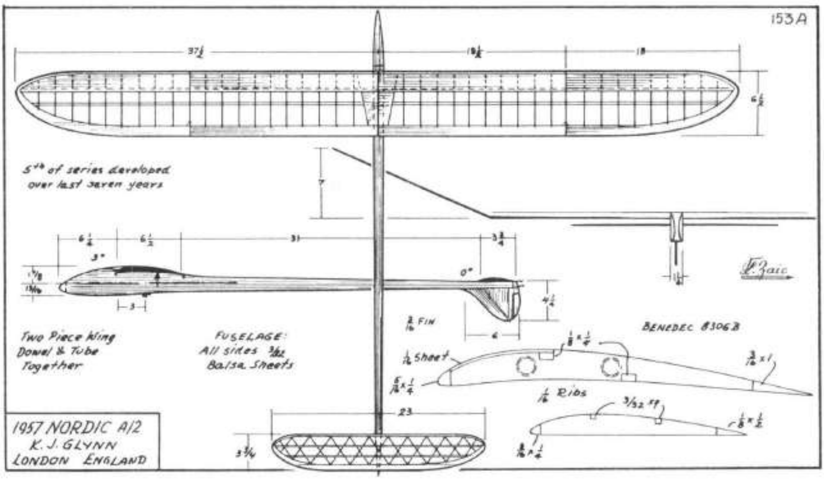


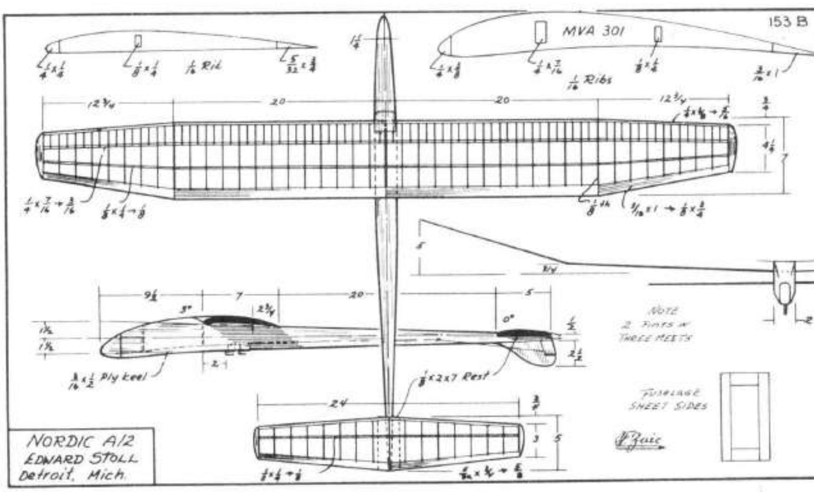
152
CHEESEMAN 25-100-10
NOTE: XACT DROOP VERY IMPORTANT
DURING THREE YEARS OF FLYING ONLY SLIGHT CHANGES MADE. HAS EXCELLENT STALL RECOVERY AN ALL-AROUND PERFORMER IN VARIOUS TYPES OF WEATHER - WING SECTION MAJOR CONTRIBUTOR TO SUCCESS & RELIABILITY.
1/16 TIP — RIBS — 3/32 CENTER
FUSELAGE 3/32 SIDES 1/16 TOP & BOTTOM
WING BOXES
TIP DIHEDRAL ONLY
1/8 PLY TONGUE
CONSTANT WIDTH 1"
PROXY FLOWN TWICE.— ON RETURN FOUND ADJUSTMENTS CHANGED. WHEN CORRECT TOP PERFORM. REGAINED
AVERAGES 2m 30 sec IN STILL AIR
BALLAST: 2oz IN NOSE 2oz AT C.G.
C.G. MUST BE AT 55% WITH HOOK 1/2" IN FRONT
FINS - 2 1/2 x 4
DESIGN DUPLICATED BY OTHERS. FLIGHT PATTERN AS ORIGINAL
FROM DWG IN MONTREAL M.F.C. BULLETIN BY B.V. HAISMAN
FUSELAGE 1" sq
1/32 RIBS
8% CLARK Y
NORDIC A-2
DON MACKENZIE
MONTREAL CANADA

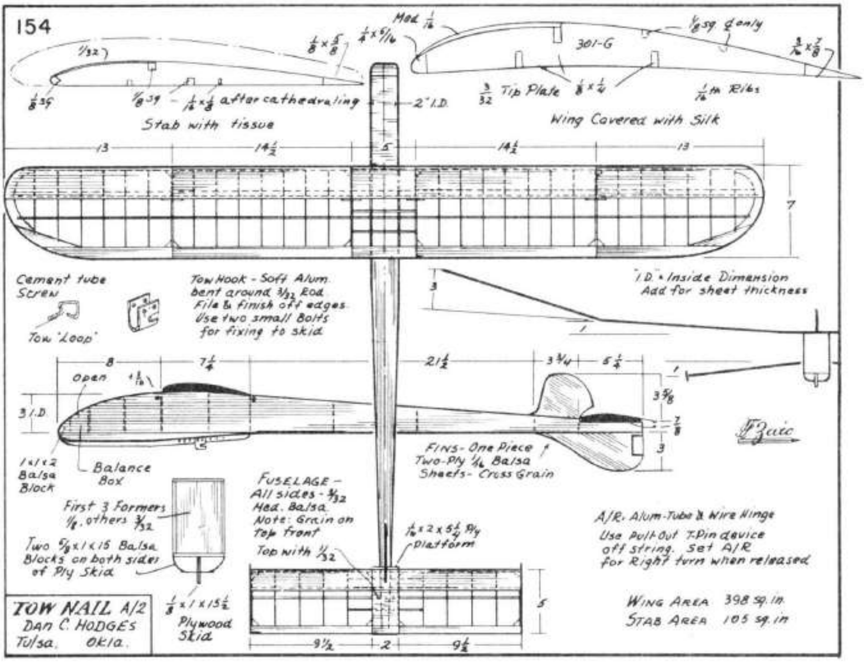


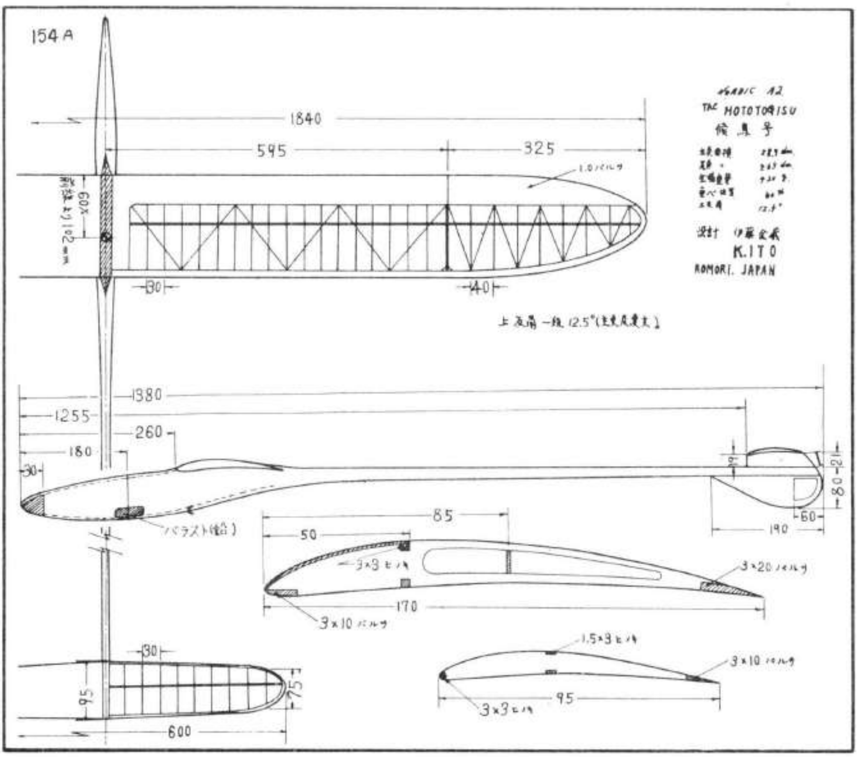
152 A
1/8 x 1 Very Hard
Wing: 439 sq in
Stab: 81 sq in
MVA 123
1/16 x 1/2 Spars
1/16 th Filler
5° Washout
Nose is Plywood and Balsa sandwich
3/32 Lam.
40° Popup
1/8 th Sheet
MVA 123
BILBOB II: A-2
by BILL & BOB LANE
LOS ANGELES CALIF.
A—A

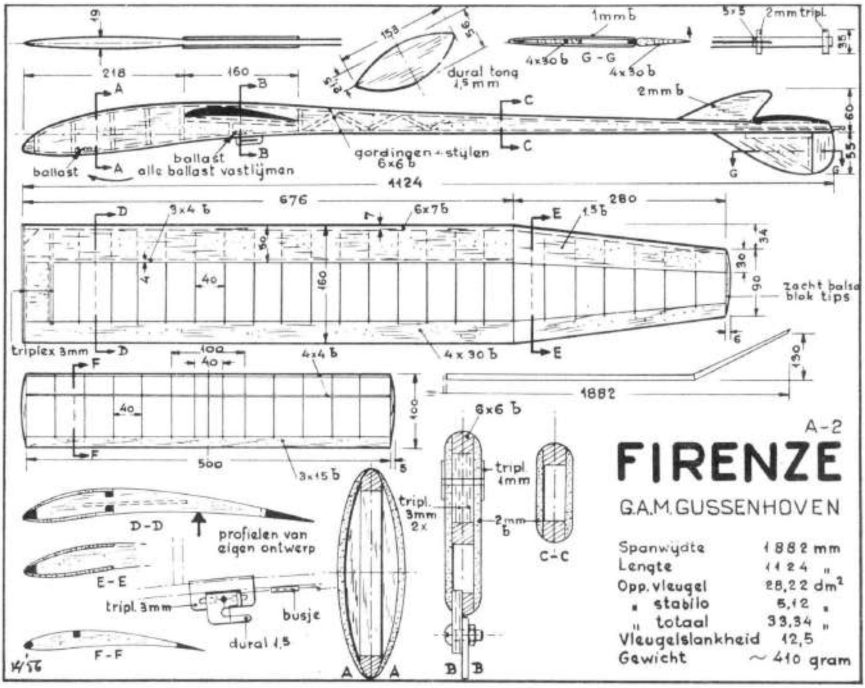

153
280
1300
280
120
140
Fuselage tissue covered
1090
120
Benedek 8356 b/2
Wing area 28,6 dm²
Tailplane area 4,9 dm²
Weight 410 gr.
12th World Championship 1956
100
490
100
IKARUS IV A2
OTTÓ RÖSER BUDAPEST


153 A
37½
6½
5th of series developed
over last seven years
7
31
3°
0°
4¼
Two Piece Wing
Dowel & Tube
Together
FUSELAGE:
All sides 3/32
Balsa Sheets
BENEDEC 8306 B
1/16 Sheet
1/16 Ribs
3/32 sq
23
3¾
1957 NORDIC A/2
K. J. GLYNN
LONDON ENGLAND

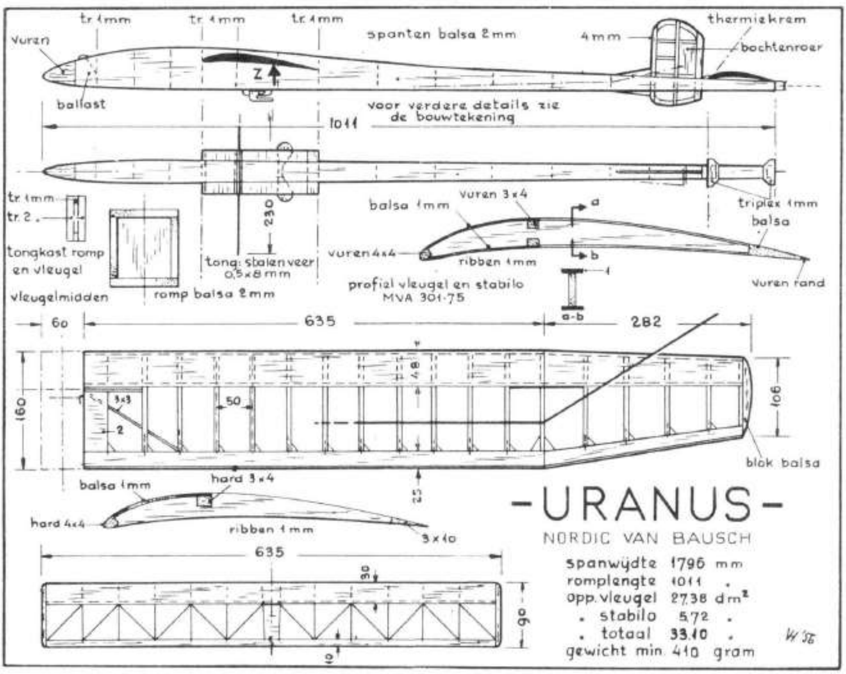

153 B
1/16 Rib
MVA 301
1/16 Ribs
12¾
20
20
12¾
4½
7
5
9½
7
20
5
3°
0°
2¾
NOTE
2 FINS W
THREE MEETS
3/16 x ½ Ply keel
1/8 x 2 x 7 Rest
24
3
5
FUSELAGE
SHEET SIDES
NORDIC A/2
EDWARD STOLL
Detroit, Mich.


154
Stab with tissue
Wing Covered with Silk
Tip Plate
301-G
2" I.D.
"I.D." = Inside Dimension
Add for sheet thickness
Cement tube
Screw
Tow "Loop"
Tow Hook - Soft Alum. bent around 3/32 Rod. File & finish off edges. Use two small Bolts for fixing to skid
Open
Balance Box
Balsa Block
First 3 Formers 1/8, others 3/32
Two 5/8 x 1 x 15 Balsa Blocks on both sides of Ply Skid
FINS - One Piece Two-Ply 1/16 Balsa Sheets - Cross Grain
FUSELAGE - All sides - 3/32 Med. Balsa. Note: Grain on top front
Top with 1/32
Platform
Plywood Skid
A/R. Alum-Tube & Wire Hinge
Use Pull-Out T-Pin device off string. Set A/R for Right turn when released
WING AREA 398 sq. in.
STAB AREA 105 sq. in
TOW NAIL A/2
DAN C. HODGES
Tulsa. Okla.

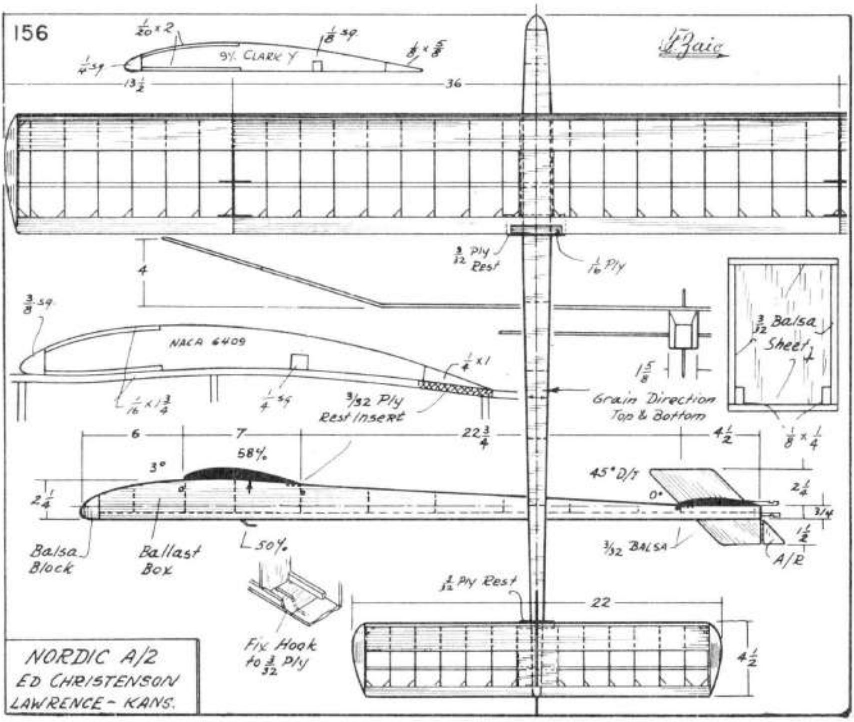

154 A
1840
595
325
1380
1255
260
180
85
50
170
600
95
THE HOTOTOGISU
設計
K.ITO
KOMORI. JAPAN

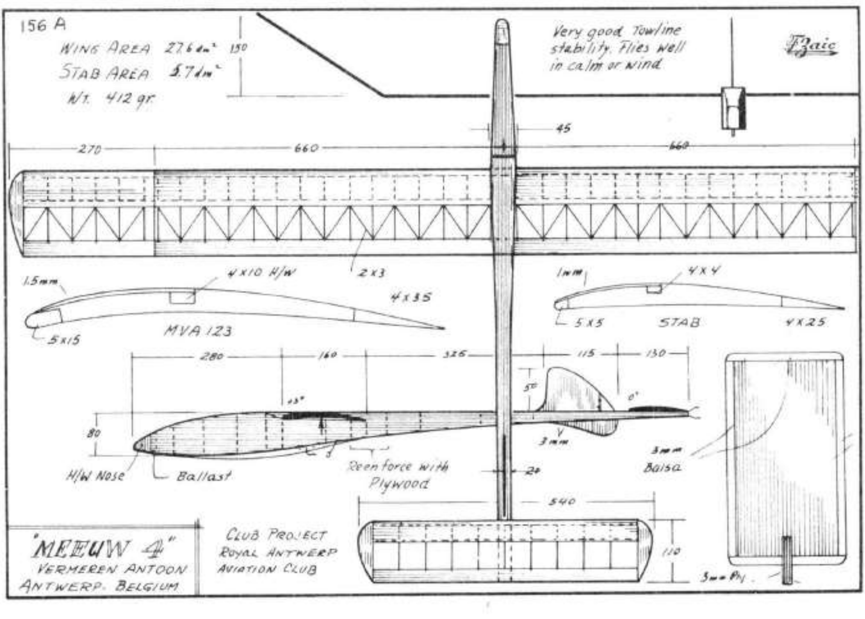


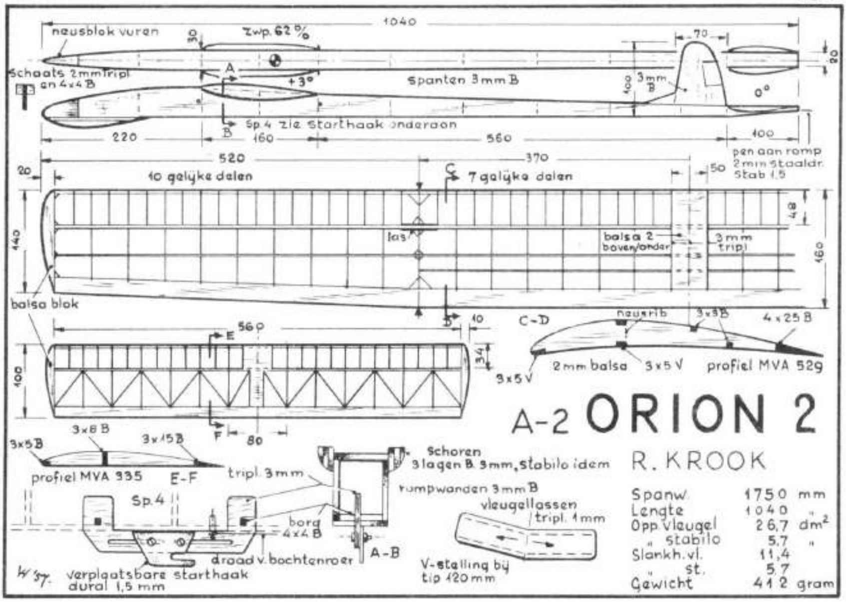
A-2
FIRENZE
G.A.M. GUSSENHOVEN
Spanwydte 1882 mm
Lengte 1124 „
Opp. vleugel 28,22 dm²
„ stabilo 5,12 „
„ totaal 33,34 „
Vleugelslankheid 12,5
Gewicht ~ 410 gram
1mm b
2mm tripl.
G - G
4x30 b
dural tong 1,5 mm
2mm b
ballast
alle ballast vastlijmen
gordingen + stylen 6x6 b
1124
676
280
3x4 b
6x7b
1,5 b
zacht balsa blok tips
triplex 3mm
4x4 b
4 x 30 b
1882
500
3x15 b
6x6 b
tripl. 1mm
tripl. 3mm 2x
2mm b
C-C
D-D
profielen van eigen ontwerp
E-E
tripl. 3mm
busje
dural 1,5
F-F
14/56

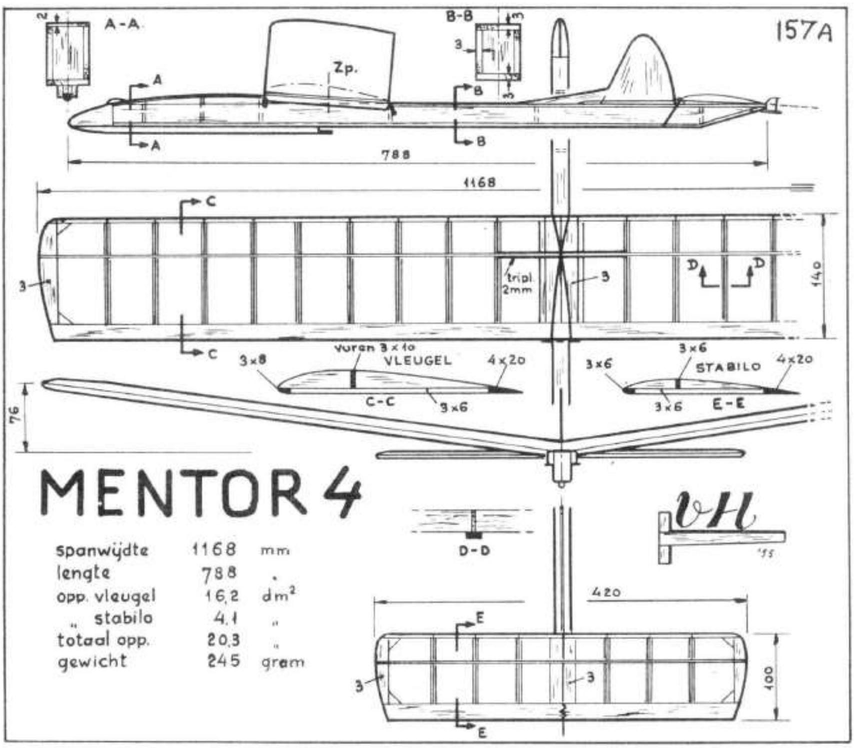


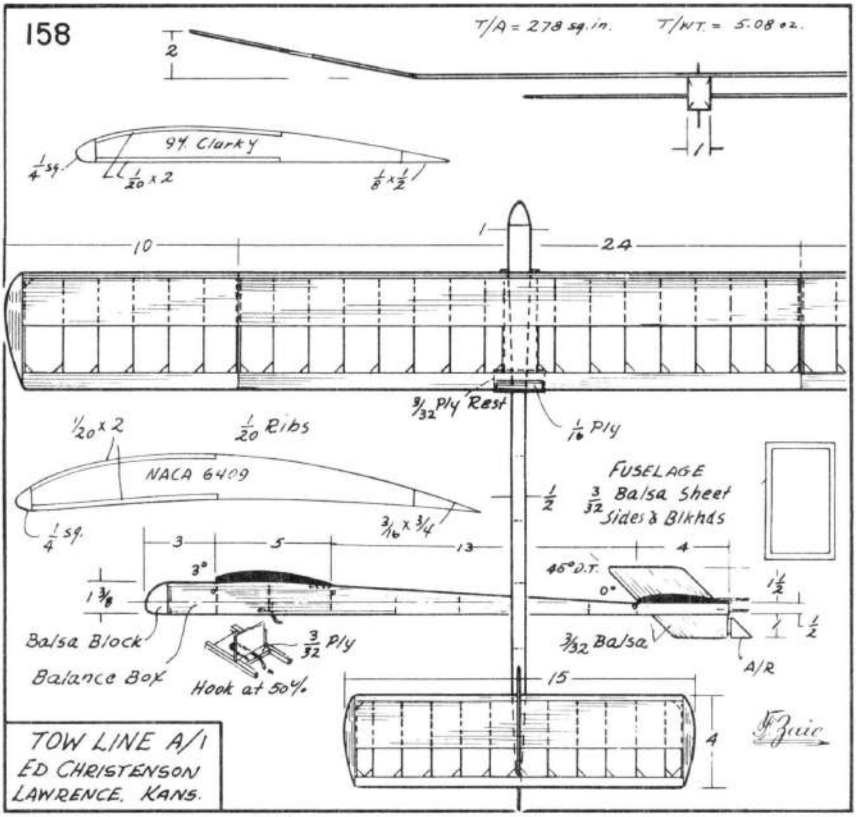
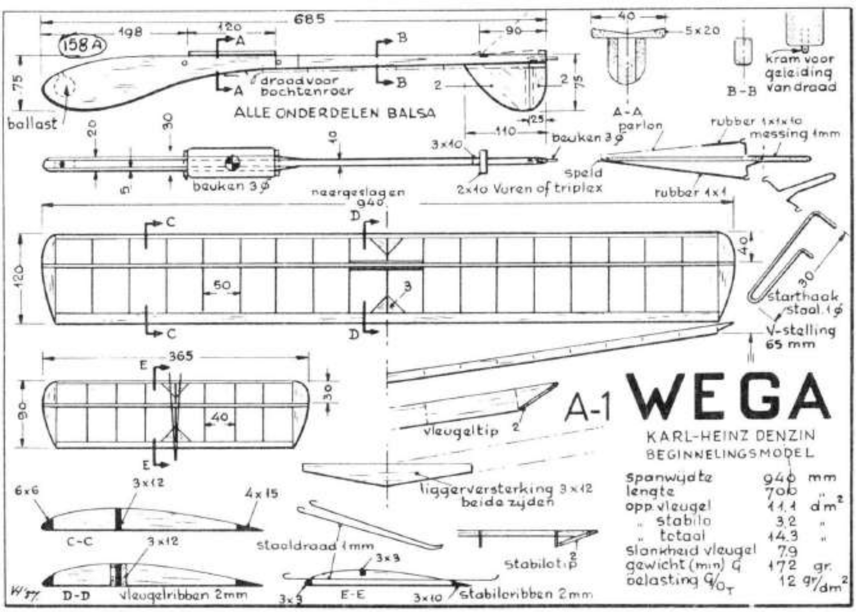
-URANUS-
NORDIC VAN BAUSCH
spanwydte 1796 mm
romplengte 1011 .
opp. vleugel 27.38 dm²
. stabilo 5.72 .
. totaal 33.10 .
gewicht min. 410 gram
tr. 1mm
vuren
spanten balsa 2mm
4mm
thermiekrem
bochtenroer
ballast
voor verdere details zie de bouwtekening
1011
tr. 1mm
tr. 2
tongkast romp en vleugel
vleugelmidden
romp balsa 2mm
tong: stalen veer 0,5x8 mm
230
balsa 1mm
vuren 3x4
vuren 4x4
ribben 1mm
profiel vleugel en stabilo MVA 301-75
triplex 1mm
balsa
vuren rand
a-b
60
635
282
160
106
50
blok balsa
balsa 1mm
hard 3x4
hard 4x4
ribben 1mm
3x10
635
90
W '56

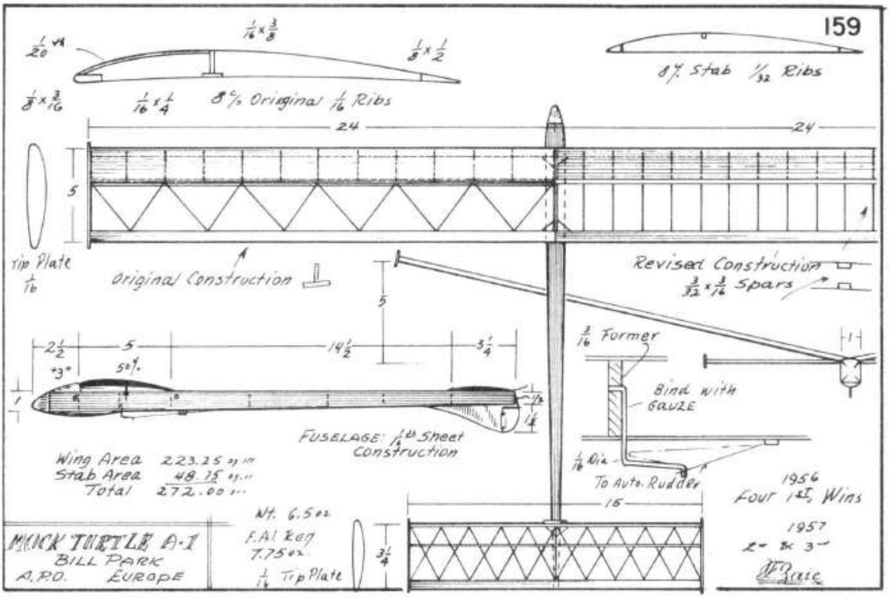

156
9% CLARK Y
36
NACA 6409
3/32 Ply Rest Insert
Grain Direction Top & Bottom
3/32 Balsa Sheet
45° D/T
58%
50%
Balsa Block
Ballast Box
3/32 BALSA
A/R
Fix Hook to 3/32 Ply
1/32 Ply Rest
22
NORDIC A/2
ED CHRISTENSON
LAWRENCE - KANS.

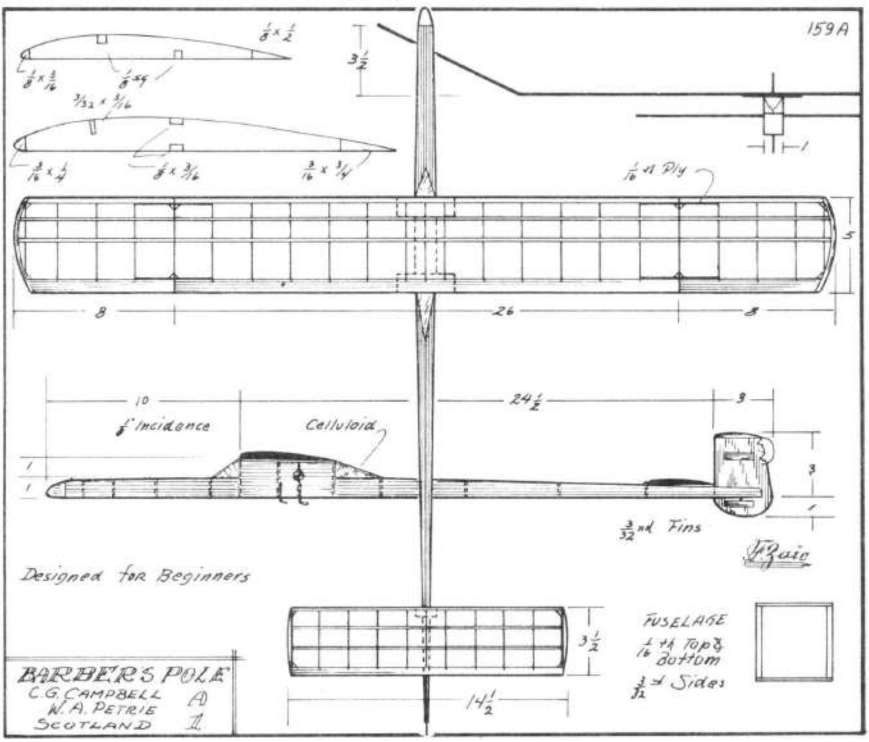

156 A
WING AREA 27.6 dm²
STAB AREA 5.7 dm²
Wt. 412 gr.
Very good Towline stability. Flies well in calm or wind
270
660
660
45
4x10 H/W
2x3
4x35
MVA 123
5x15
1.5mm
1mm
4x4
5x5
STAB
4x25
280
160
325
115
130
80
H/W Nose
Ballast
Reenforce with Plywood
3mm Balsa
540
110
3mm Ply
"MEEUW 4"
VERMEEREN ANTOON
ANTWERP - BELGIUM
CLUB PROJECT
ROYAL ANTWERP AVIATION CLUB

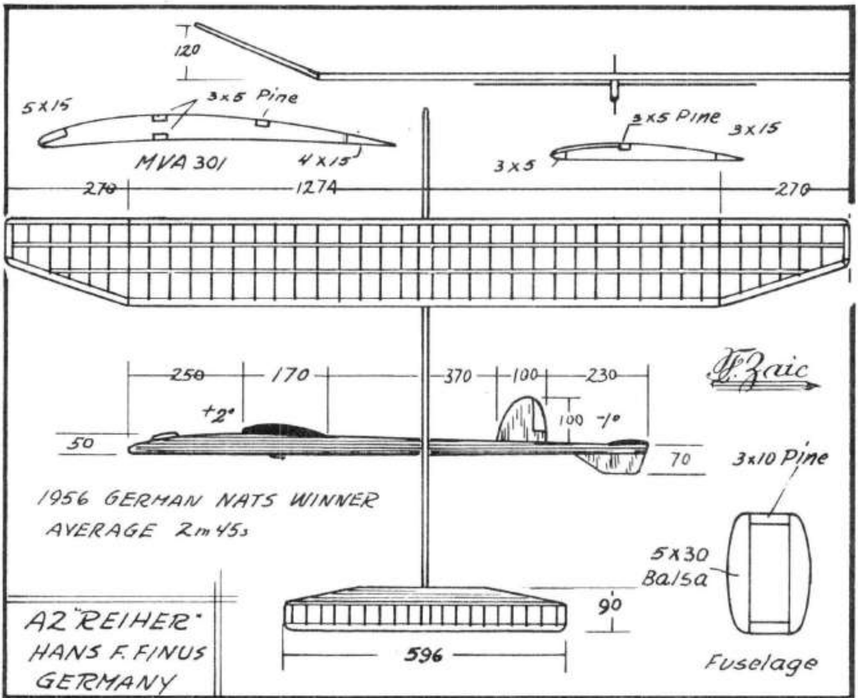

A-2 ORION 2
R. KROOK
neusblok vuren
Zwp. 62 %
1040
Schaats 2mm tripl en 4x4 B
+3°
spanten 3mm B
0°
Sp.4 zie starthaak onderaan
220
160
560
400
520
370
pen aan romp 2mm staaldr. Stab 1,5
10 gelijke delen
7 gelijke delen
las
balsa 2 boven/onder
3mm tripl
balsa blok
560
C-D
neusrib
3x8B
4x25B
3x5V
2mm balsa
3x5V
profiel MVA 529
3x5B
3x8B
3x15B
profiel MVA 335
E-F
tripl. 3mm
Sp.4
borg 4x4 B
draad v. bochtenroer
A-B
Schoren 3 lagen B 3mm, stabilo idem
rompwanden 3mm B
vleugellassen tripl. 1mm
V-stelling bij tip 120 mm
verplaatsbare starthaak dural 1,5 mm
Spanw. 1750 mm
Lengte 1040 "
Opp. vleugel 26,7 dm²
" stabilo 5,7 "
Slankh. vl. 11,4
" st. 5,7
Gewicht 412 gram

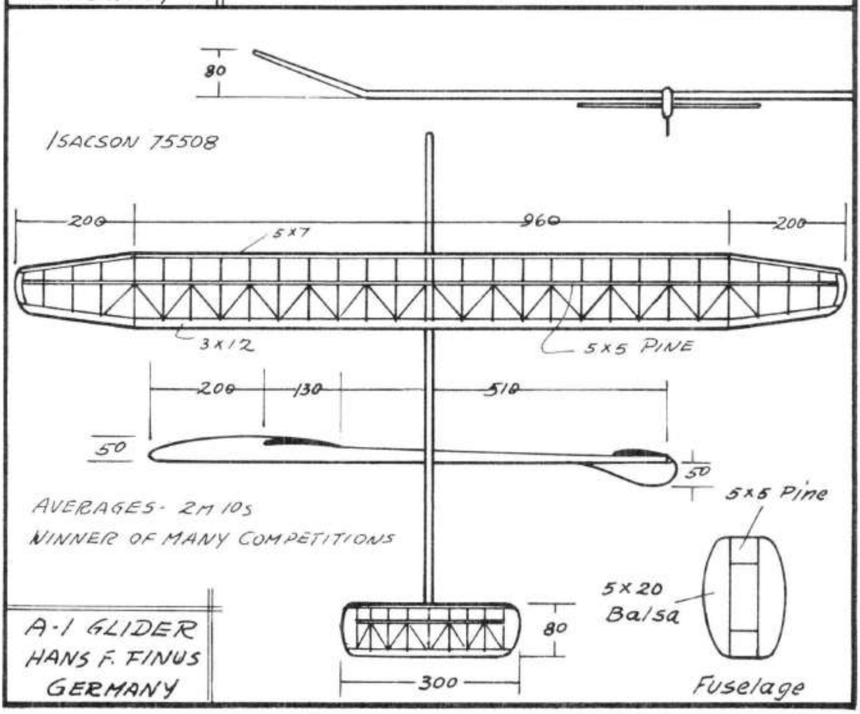

157A
A-A
B-B
Zp.
788
1168
tripl. 2mm
3
vuren 3x10
VLEUGEL
3x8
4x20
C-C
3x6
3x6
STABILO
4x20
E-E
76
140
MENTOR 4
D-D
vH
420
100
spanwijdte 1168 mm
lengte 788 "
opp. vleugel 16,2 dm²
" stabilo 4,1 "
totaal opp. 20,3 "
gewicht 245 gram

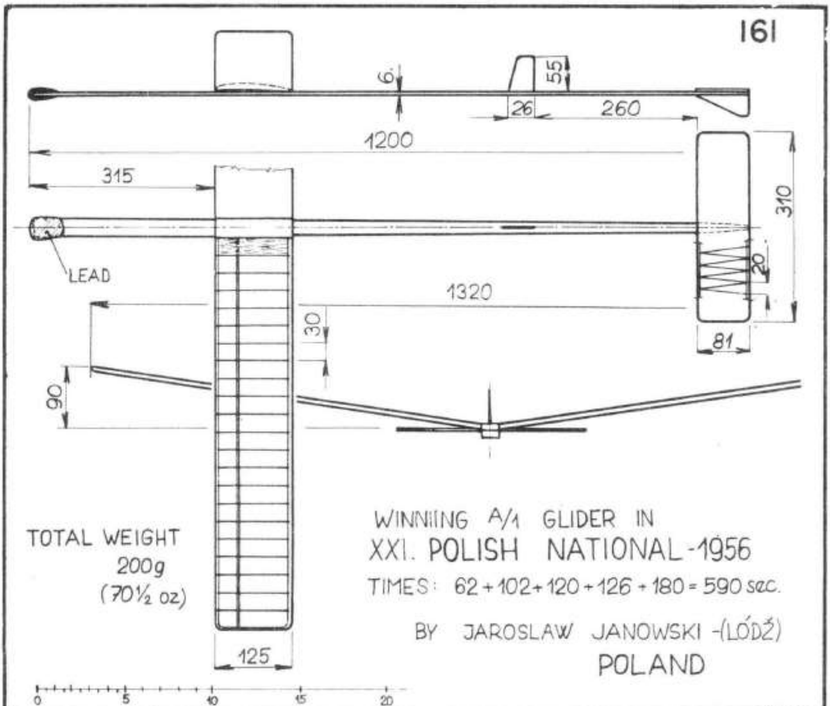

158
T/A = 278 sq. in.
T/WT. = 5.08 oz.
9% Clark Y
1/4 sq.
1/20 x 2
1/8 x 1/2
10
24
3/32 Ply Rest
1/16 Ply
1/20 x 2
1/20 Ribs
NACA 6409
1/4 sq.
3/16 x 3/4
FUSELAGE
3/32 Balsa Sheet
Sides & Blkhds
45° D.T.
Balsa Block
Balance Box
3/32 Ply
Hook at 50%
3/32 Balsa
A/R
15
TOW LINE A/1
ED CHRISTENSON
LAWRENCE, KANS.
F. Zaic

158 A
685
198
120
90
draad voor bochtenroer
ALLE ONDERDELEN BALSA
ballast
beuken 3 ø
naergeslagen
2x10 Vuren of triplex
perlon
rubber 1x1x10
messing 1mm
speld
rubber 1x1
kram voor geleiding van draad
B-B
A-A
5x20
940
starthaak staal 1 ø
V-stelling 65 mm
365
vleugeltip
A-1 WEGA
KARL-HEINZ DENZIN
BEGINNELINGSMODEL
liggerversterking 3x12 beide zijden
staaldraad 1mm
stabilotip
C-C
D-D
E-E
vleugelribben 2mm
stabiloribben 2mm
spanwijdte 940 mm
lengte 700 "
opp. vleugel 11.1 dm²
" stabilo 3.2 "
" totaal 14.3 "
slankheid vleugel 7.9
gewicht (min) G 172 gr.
belasting G/O_T 12 gr/dm²


159
8% Original 1/16 Ribs
8% Stab 1/32 Ribs
Tip Plate 1/16
Original Construction
Revised Construction
3/32 x 3/16 Spars
3/16 Former
Bind with GAUZE
1/16 Dia.
To Auto. Rudder
FUSELAGE: 1/16th Sheet Construction
Wing Area 223.25 sq. in
Stab Area 48.75 sq. in
Total 272.00 sq. in
Wt. 6.5 oz
F.AI. Req. 7.75 oz.
1/16 Tip Plate
1956 Four 1st Wins
1957 2nd & 3rd
MOCK TURTLE A-1
BILL PARK
A.P.O. EUROPE

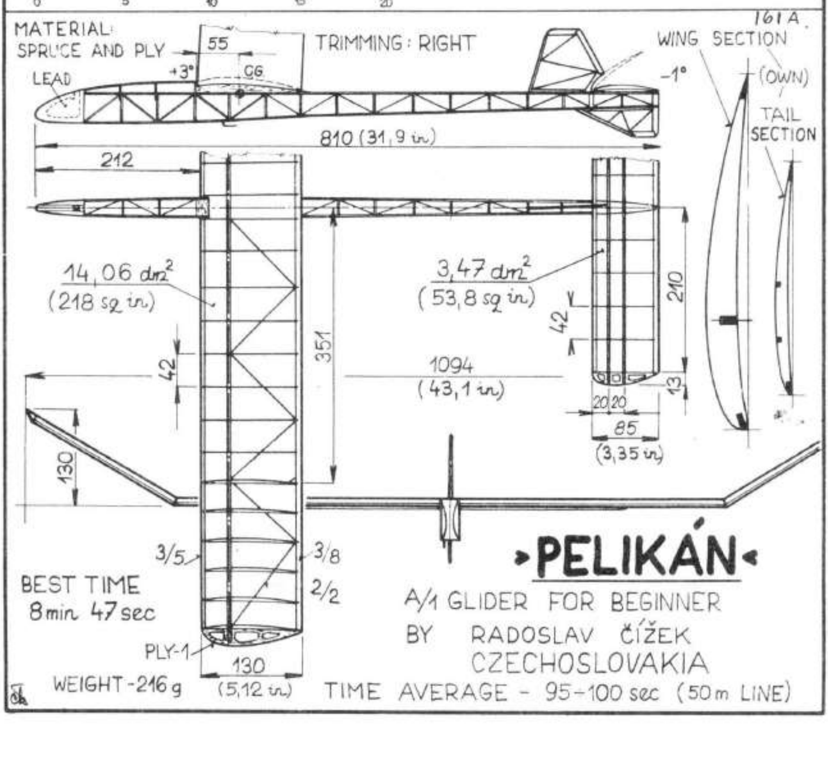

159A
1/16 th Ply
1/8 Incidence
Celluloid
3/32 nd Fins
Designed for Beginners
FUSELAGE
1/16 th Top & Bottom
3/32 nd Sides
BARBER'S POLE
C.G. CAMPBELL
W.A. PETRIE
SCOTLAND


120
5x15
3x5 Pine
MVA 301
4x15
3x5 Pine
3x15
3x5
270
1274
270
250
170
370
100
230
+2°
100 -1°
50
70
3x10 Pine
1956 GERMAN NATS WINNER
AVERAGE 2m 45s
5x30
Balsa
90
A2 "REIHER"
HANS F. FINUS
GERMANY
596
Fuselage


80
ISACSON 75508
200
960
200
5x7
3x12
5x5 PINE
200
130
510
50
50
5x5 Pine
AVERAGES - 2m 10s
WINNER OF MANY COMPETITIONS
5x20
Balsa
A-1 GLIDER
HANS F. FINUS
GERMANY
80
300
Fuselage

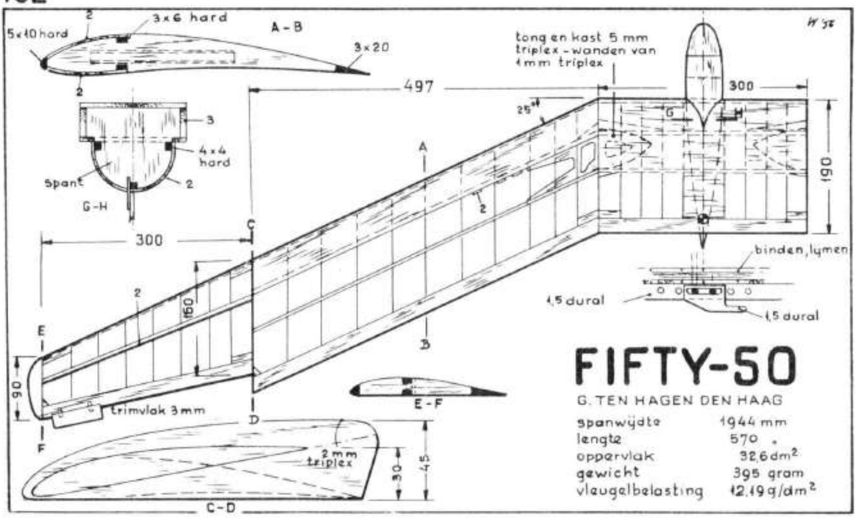


161
6
55
26
260
1200
315
310
LEAD
20
1320
30
81
90
WINNIING A/1 GLIDER IN
XXI. POLISH NATIONAL - 1956
TIMES: 62 + 102 + 120 + 126 + 180 = 590 sec.
BY JAROSLAW JANOWSKI -(ŁÓDŹ)
POLAND
TOTAL WEIGHT
200g
(70½ oz)
125
0 5 10 15 20



161 A.
MATERIAL:
SPRUCE AND PLY
55
TRIMMING: RIGHT
WING SECTION
(OWN)
LEAD
+3°
CG
-1°
TAIL SECTION
810 (31,9 in)
212
14,06 dm²
(218 sq in)
3,47 dm²
(53,8 sq in)
210
42
351
42
1094
(43,1 in)
13
20 20
85
(3,35 in)
130
3/5
3/8
2/2
BEST TIME
8 min 47 sec
PLY-1
130
(5,12 in)
WEIGHT - 216 g
•PELIKÁN•
A/1 GLIDER FOR BEGINNER
BY RADOSLAV ČÍŽEK
CZECHOSLOVAKIA
TIME AVERAGE - 95-100 sec (50 m LINE)

162



„PADESÁTIGRAMOVÝ" WAKEFIELD

Model byl postaven jednou pro 80g svazek a dvakrát pro 50g svazek. Provedení se od sebe liší jen délkou přední části dvoudílného trupu. Přední díl má kostru z balsových lišt 3 × 3 mm a potah z 1,5 mm balsy. Zadní díl je z balsových lišt 3 × 3 mm a diagonál 2 × 3 mm.

Svazek je uchycen na duralové trubce, která se zasouvá do uchycení z překližky a balsy zezadu do trupu, takže vnější obrys trupu není vůbec porušen. Křídlo je dělené, zasouvá se balsovými jazyky do trupu.

Profil křídla (vlastní) je 9,7 % tlustý v 25 % hloubky. Zakřivení středního vlákna činí 8 % v 50 % hloubky. Poloměr náběžné hrany r = 2 %. Ačkoli poloměr náběžné hrany je značně větší než doporučovaná hodnota (podle Schmitze r = 0,4 %), je profil bezpečně nadkriticky obtékán. Profil výškovky je podobný profilu NACA 20 A-08.

Model je potažen hedvábným papírem a třikrát lakován hustším cellonovým lakem.

VÁHY

Vrtule s ložiskem	48	g
Přední část trupu	54	g
Zadní část trupu	10	g
Křídlo	39	g
Výškovka	5,5	g
Směrovka	3,5	g
Svazek (nemazaný)	48	g
Zátěž	24	g
Celkem	232	g

Se svazkem z 48 nití (64 mm²) maďarské gumy dosahuje model na 450 otáček 40 až 50 m výšky za 50 vteřin a průměrného výkonu 2 min 40 vt.

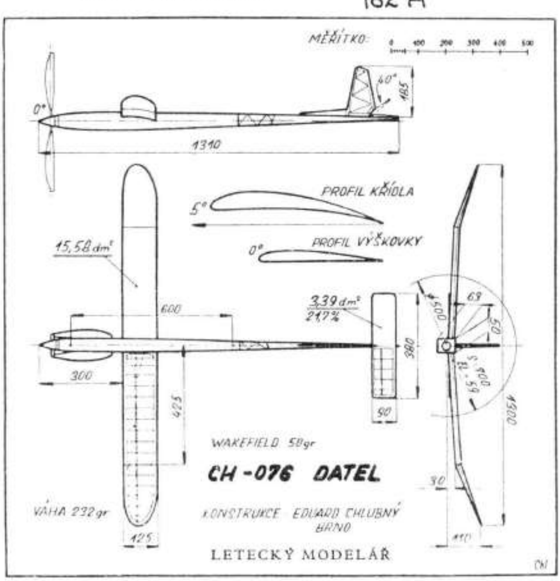
Model zvítězil ve své kategorii v soutěži „Brněnská guma" výkonem 791 vteřin. Na CMS 1956 se soudruh Tichý se stejným typem umístil jako osmý.

Při zimních letových dnech KA Brno v lednu 1957 obsadil model v celkovém pořadí 1. a 2. místo. Bylo použito svazku 80g a létalo se za teploty 0° až —5° C. Se svazkem z gumy Pirelli o průřezu 96 mm² pohybovaly se výkony na 500 otáček okolo 4 minut. Model vynikal velmi malou klesavostí a pomalým klouzavým letem.

Eduard CHLUBNÝ, KA Brno

Datel

162 A



FLYING WINGS by Bruce Forster Haverstown, Pa.

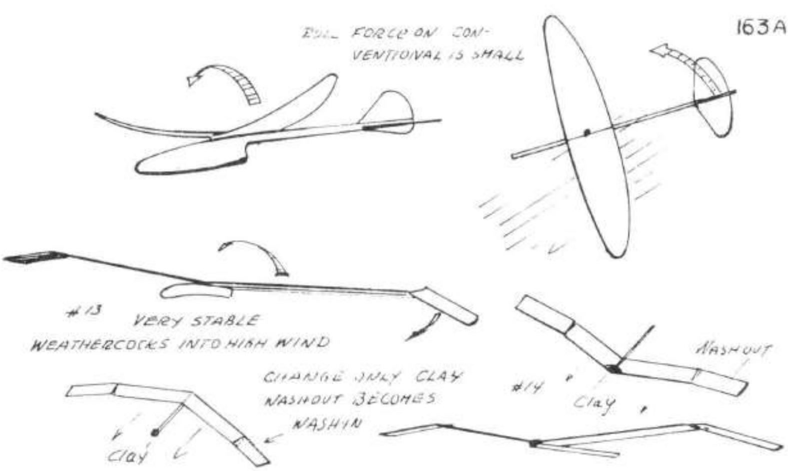
The 1955-56 Yearbook is very good, I thoroughly enjoy it. Articles like Mr. A. C. Brown's will keep me pondering for months. Enclosed is a check for two '53 Y. B. to try to interest some of the neighborhood ½A U-control prefabers. I am sixteen and work in a hobby shop, so I know how hard it is to interest somebody in this end of the hobby.

I am interested in flying wings or tailess models. Because less is known about 'wings' than any other fixed-wing aircraft, both model and full-scale, there is a large challenge to the modeler in the development of them.

As you know, wash-out or negative tips are used for longitudal stability on swept-back wings. With cathedral applied to the negative section, lateral stability can be obtained. The action of a rudder on a conventional plane is to counter-act, neutralize or stabilize the dihedral effect. By putting a wing in a drift or turning view as in MODEL GLIDER DESIGN, page 96, it can be seen that the cathedral tips neutralizes or stabilizes the dihedral of the main section. With this item, no rudders are needed. Without it, the model will have lateral instability and rudder aera problems as did Mr. F. S. Gue.

Since the force of the negative section is down, it is more efficient to have the airfoil doing this work in a inverted position. Also, the relative angle of attack of this section is near 0 degree for a better L/D ratio. By using a high lift foil in the negative section, the stability is more effective. This was proven by using pitching moment charts.

I am flying now No. 14, which by changing the balance and cathedral can be flown in either direction.



NOTES ON H. L. by Dick Baxter Lancaster, Calif.

I built a glider form JASCO DART kit supplies—which pretty much determined the relative wing and tail areas and moment arms, which were limited by the material available. In other words, the only difference from a DART was extreme tail tilt and no rudder offset used to turn the glider. Tail tilt was about 25-20 degrees. It produced some interesting results.

1. It threw extremely well.

2. It would roll out either way from almost any kind of launch.

3. Its C.G. range for stable glide was very wide, due to coupling between the gliding turn radius and the C.G. The former tightening as C.G. moved back. In fact, if one removed enough nose weight the glider does not stall but spirals in!

In general this was the only non-critical H.L. I ever built. Now, your interest lies here, a couple of kids pestered me last summer to teach them to build models. So we started on gliders. I let them build any conventional looking shape they wanted with not more than 1 to 2 degrees of decalage. And I made them use large tail tilts. We tried these gliders by hand gliding them—and never touched the trim again. Three in all got finished, and the 8 to 12 year old kids got good roll outs on one out of two flight tries with no trim trouble. Could be a very good feature for H.L. glider kits, especially for kids.

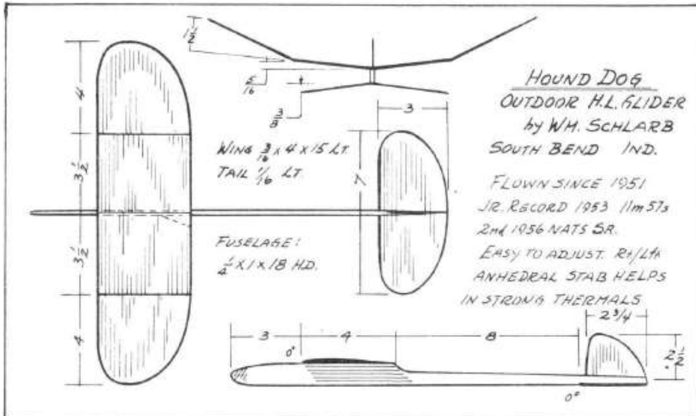
H. L. DESIGNS by John D. Nogy Canoga Park, Calif.

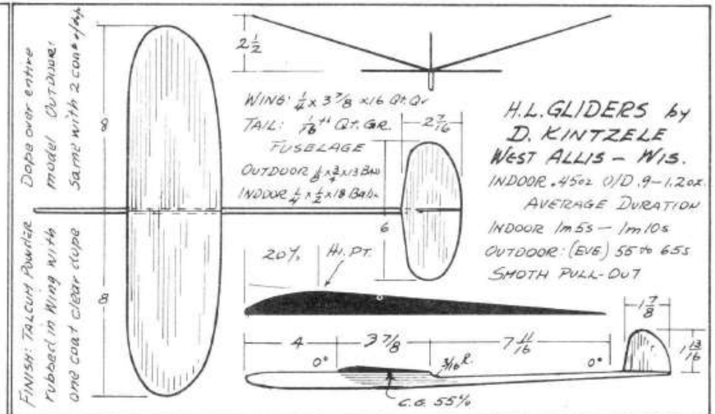
This H. L. Glider model, see page 167, was one of a series of designs for Mile High Flying at Denver, Colo., where I used to live. That is the reason why the model is light and has high undercamber. But this design proved even better at low altitude, the undercamber used will slow the glider down quite a bit in the glide, especially when the nose is into the wind.

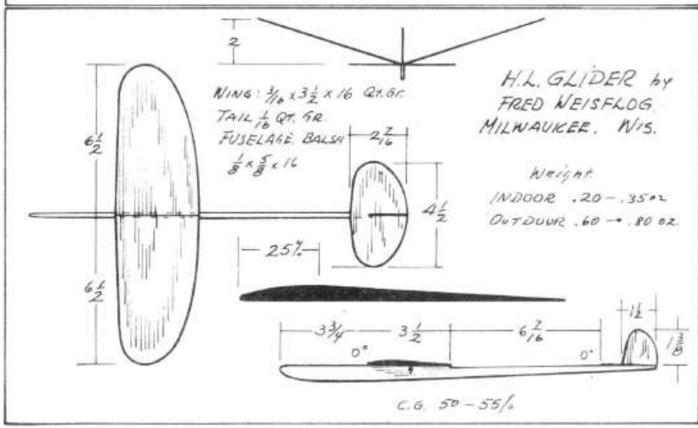
I also found that just about a straight up and to the right launch with one turn, so the model lays out on top with a left turn glide, will give more altitude than conventional right launch. However, this is up to the modeler's discretion.

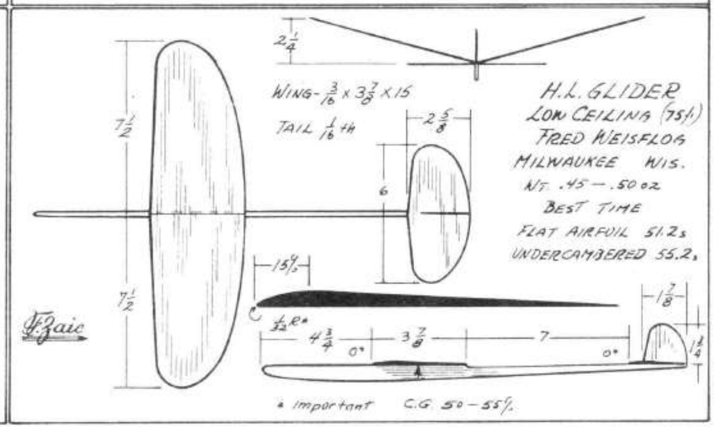
The design is also a good indoor job if you are not hampered by low ceiling as this model will really get upstairs providing a good launch and strong arm are available.

Wood used on surfaces was very light grade balsa. The basswood fuselage can be easily "warped" by blowing hot breath on it ahead of the stab, and twisting it to the desired position. It seems that basswood will hold adjustments much better than warps on the stab or rudder.


HOUND DOG
OUTDOOR H.L. GLIDER
by WM. SCHLARB
SOUTH BEND IND.
FLOWN SINCE 1951
JR. RECORD 1953 11m 57s
2nd 1956 NATS SR.
EASY TO ADJUST. Rt/Lft
ANHEDRAL STAB HELPS
IN STRONG THERMALS
WING 3/16 x 4 x 15 LT.
TAIL 1/16 LT.
FUSELAGE:
1/4 x 1 x 18 HD.


H.L. GLIDERS by
D. KINTZELE
WEST ALLIS - WIS.
INDOOR .45oz O/D .9-1.2oz.
AVERAGE DURATION
INDOOR 1m 5s - 1m 10s
OUTDOOR: (EVE) 55 to 65s
SMOOTH PULL-OUT
WING: 1/4 x 3 7/8 x 16 Qt. Gr.
TAIL: 1/16" Qt. GR.
FUSELAGE
OUTDOOR 1/8 x 3/4 x 13 Bal.
INDOOR 1/4 x 1/2 x 18 Bal.
Dope over entire model OUTDOOR! Same with 2 coats of dope
FINISH: TALCUM Powder rubbed in Wing with one coat clear dope
20% HI. PT.
C.G. 55%


H.L. GLIDER by
FRED WEISFLOG
MILWAUKEE. WIS.
WING: 3/16 x 3 1/2 x 16 Qt. Gr.
TAIL 1/16 QT. GR.
FUSELAGE BALSA
1/8 x 5/8 x 16
Weight
INDOOR .20 - .35 oz
OUTDOOR .60 → .80 oz.
25%
C.G. 50 - 55%


H.L. GLIDER
LOW CEILING (75')
FRED WEISFLOG
MILWAUKEE WIS.
WT. .45 - .50 oz
BEST TIME
FLAT AIRFOIL 51.2s
UNDERCAMBERED 55.2s
WING - 3/16 x 3 7/8 x 15
TAIL 1/16 th
15%
* important C.G. 50 - 55%
F. Zaic

BUILDING H. L. by Lee Hines Torrance, Calif.

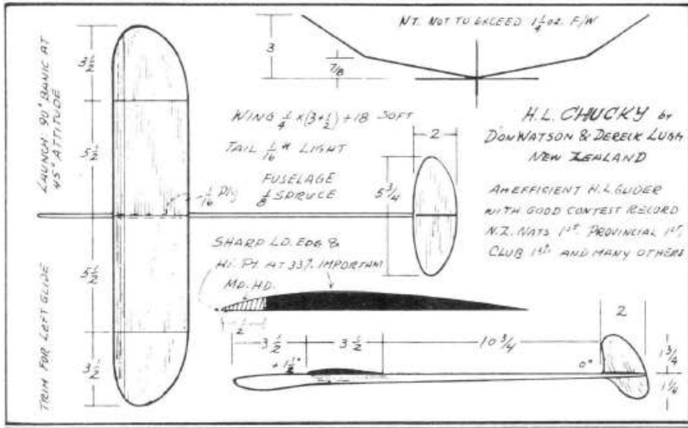
Although I've been pidling with H.L. Gliders for over four years I am just beginning to appreciate their fine points. The enclosed design is my latest attempt. It seems to fit my squeaking arm, and behaves pretty good in thermals. Using Conover's trim method—washin left wing and left rudder setting. Found that it gives good roll-out as well as keep constant circle in a thermal.

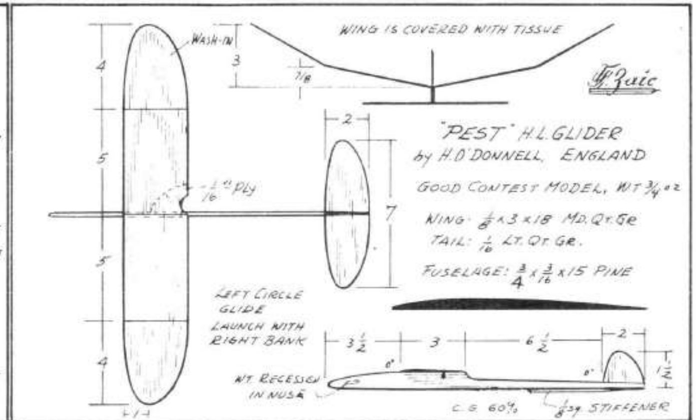
At present I am undecided how to design the next glider. Should I build a very light 18-20 inch span, or small 15-17 inch span for fast and high climb. Tried small ones with weight under 3/4 oz., but this was not enough for my arm to throw, and it sapped the arm sometimes too quickly. Looks like an 18 inch job with .8 to 1.0 oz. weight would be the best compromise.

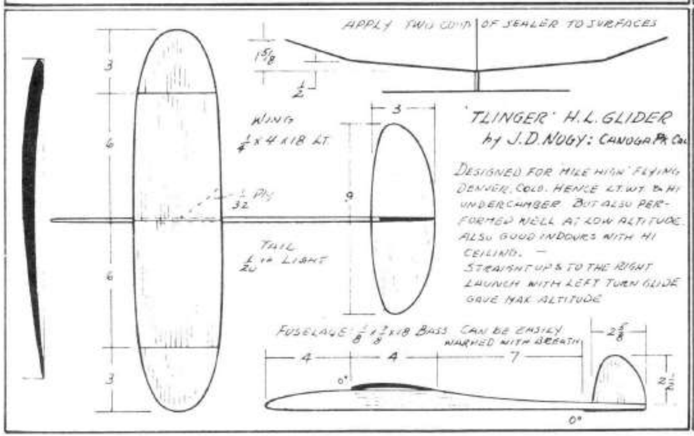
I took six indoors gliders to the Dallas Nationals. All were different in size, design and weight. I thought that if I broke one I would still have lots left, and also be sure of having one that would fit the conditions. Well, broke all of them within 30 min. An analysis showed that the fuselages broke right at the L.E. of the stab. Phil Haines advised me to use 1/8 inch hard balsa sheet stock for fuselage, and to shape it so that it will have an even flexure between wing and stab. I quickly repaired two of my best gliders and shaped the fuselages as per advice. And after cautious re-trim I gave the gliders the standard heave-hos and found the bodies to be very substantial under any circumstance! Have used this particular form of fuselage ever since, and have found it real good. And when it does snap, it is easily repaired. Noted that this form is getting around

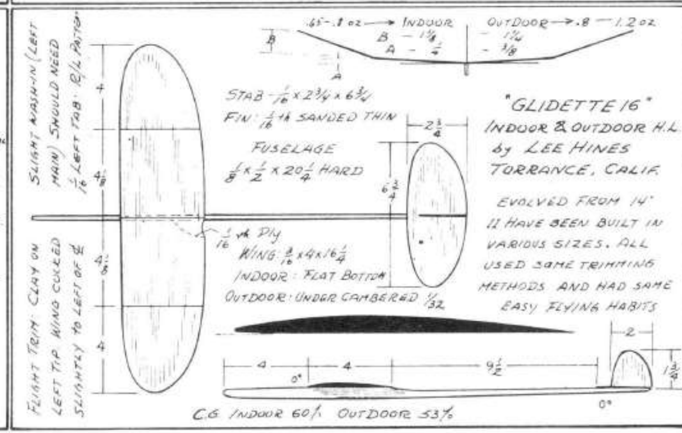
I found Stuart Savage's notes on gliders in your 56 year book most helpful. His finishing method is excellent. I found that after you think you have a smooth surface, rub it all over with the back-side of the W/D to obtain mirror-like finish. Found that 3M TRI-M-ITE paper, soft back type, to be best. Tried his idea of using wire on leading edges, works fine. Also built his two gliders with success.

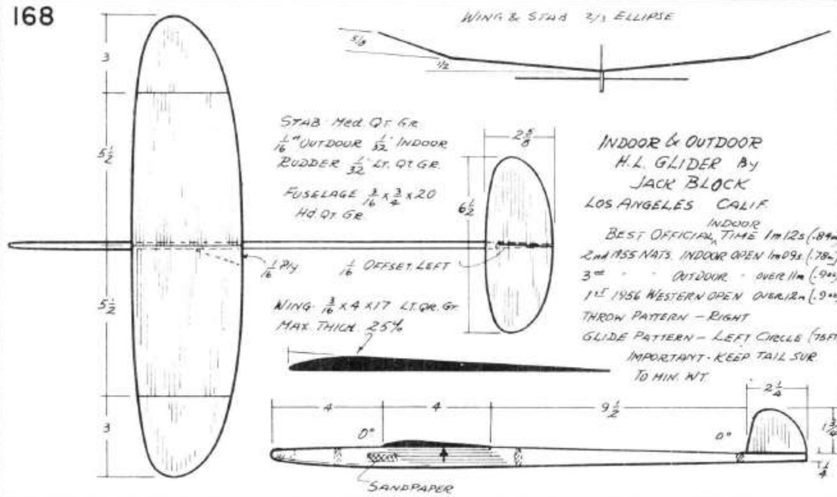
Tried elastic turbulator on my little Nordic. But it was very destabilizing. It stalled upwind, required long turn down wind, and opened up in a riser, and tightened in a downer. It may have been my lack of knowledge on how they work in different spots. Performance was improved by the removal of the turbulator. This led me to think that my airfoil was self-turbulating. To check on it, I used "pinholes" just aft of the leading edge on right wing only (it glided to left before making holes). Found that the turn was noticeably tighter. Then I "pinholed" the left wing, and noticed that the turn or circle opened up to the original diameter, and that the time went up 15 sec. with stability at all times wonderful!

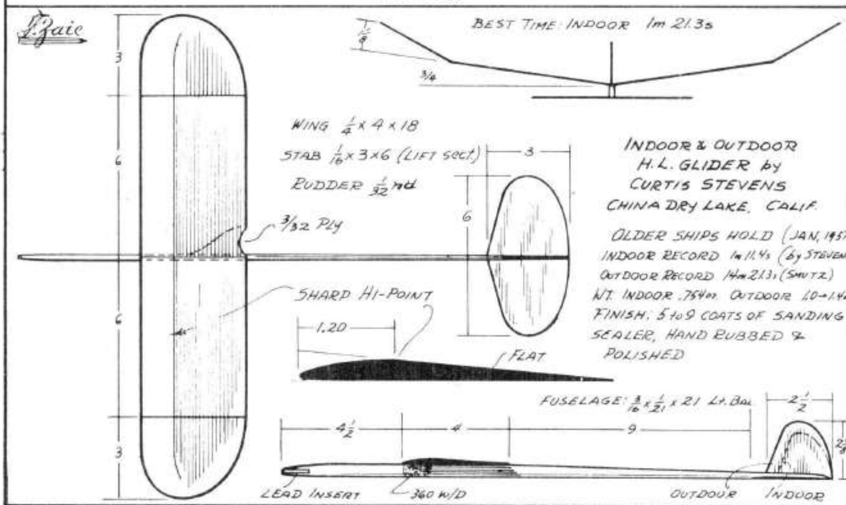

WT. NOT TO EXCEED 1 1/4 OZ. F/W
H.L. CHUCKY by DON WATSON & DERECK LUSH NEW ZEALAND
A EFFICIENT H.L. GLIDER WITH GOOD CONTEST RECORD N.Z. NATS 1ST PROVINCIAL 1ST, CLUB 1ST AND MANY OTHERS
WING 1/4 x (3+1/2) + 18 SOFT
TAIL 1/16" LIGHT
FUSELAGE 1/8 SPRUCE
1/16 PLY
SHARP LD. EDG & HI. PT. AT 33% IMPORTANT
MD. HD.
LAUNCH 90° BANK AT 45° ATTITUDE
TRIM FOR LEFT GLIDE

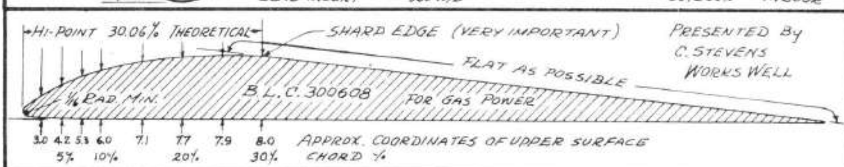

WING IS COVERED WITH TISSUE
WASH-IN
"PEST" H.L. GLIDER by H. O'DONNELL, ENGLAND
GOOD CONTEST MODEL, WT 3/4 OZ
WING: 1/8 x 3 x 18 MD. QT. GR.
TAIL: 1/16 LT. QT. GR.
FUSELAGE: 3/4 x 3/16 x 15 PINE
1/16" PLY
LEFT CIRCLE GLIDE
LAUNCH WITH RIGHT BANK
WT. RECESSED IN NOSE
C.G. 60%
1/8 SQ. STIFFENER
F. Zaic


APPLY TWO COATS OF SEALER TO SURFACES
"TLINGER" H.L. GLIDER by J.D. NOGY: CANOGA PK. CAL.
DESIGNED FOR "MILE HIGH" FLYING DENVER, COLO. HENCE LT. WT. & HI UNDERCAMBER. BUT ALSO PERFORMED WELL AT LOW ALTITUDE. ALSO GOOD INDOORS WITH HI CEILING. —
STRAIGHT UP & TO THE RIGHT LAUNCH WITH LEFT TURN GLIDE GAVE MAX ALTITUDE
WING 1/4 x 4 x 18 LT.
1/32 PLY
TAIL 1/20 LIGHT
FUSELAGE: 1/8 x 3/8 x 18 BASS CAN BE EASILY WARPED WITH BREATH


.65 - .8 OZ → INDOOR
OUTDOOR → .8 - 1.2 OZ
"GLIDETTE 16" INDOOR & OUTDOOR H.L. by LEE HINES TORRANCE, CALIF.
EVOLVED FROM 14" 11 HAVE BEEN BUILT IN VARIOUS SIZES. ALL USED SAME TRIMMING METHODS AND HAD SAME EASY FLYING HABITS
STAB - 1/16 x 2 3/4 x 6 3/4
FIN: 1/16 SANDED THIN
FUSELAGE 1/8 x 1/2 x 20 1/4 HARD
1/16 PLY
WING: 3/16 x 4 x 16 1/4
INDOOR: FLAT BOTTOM
OUTDOOR: UNDER CAMBERED 1/32
SLIGHT WASH-IN (LEFT MAIN) SHOULD NEED 1/16 LEFT TAB. R/L PATTERN
FLIGHT TRIM: CLAY ON LEFT TIP WING CURLED SLIGHTLY TO LEFT OF ℄
C.G. INDOOR 60% OUTDOOR 53%







CURT STEVENS China Lake, Calif.

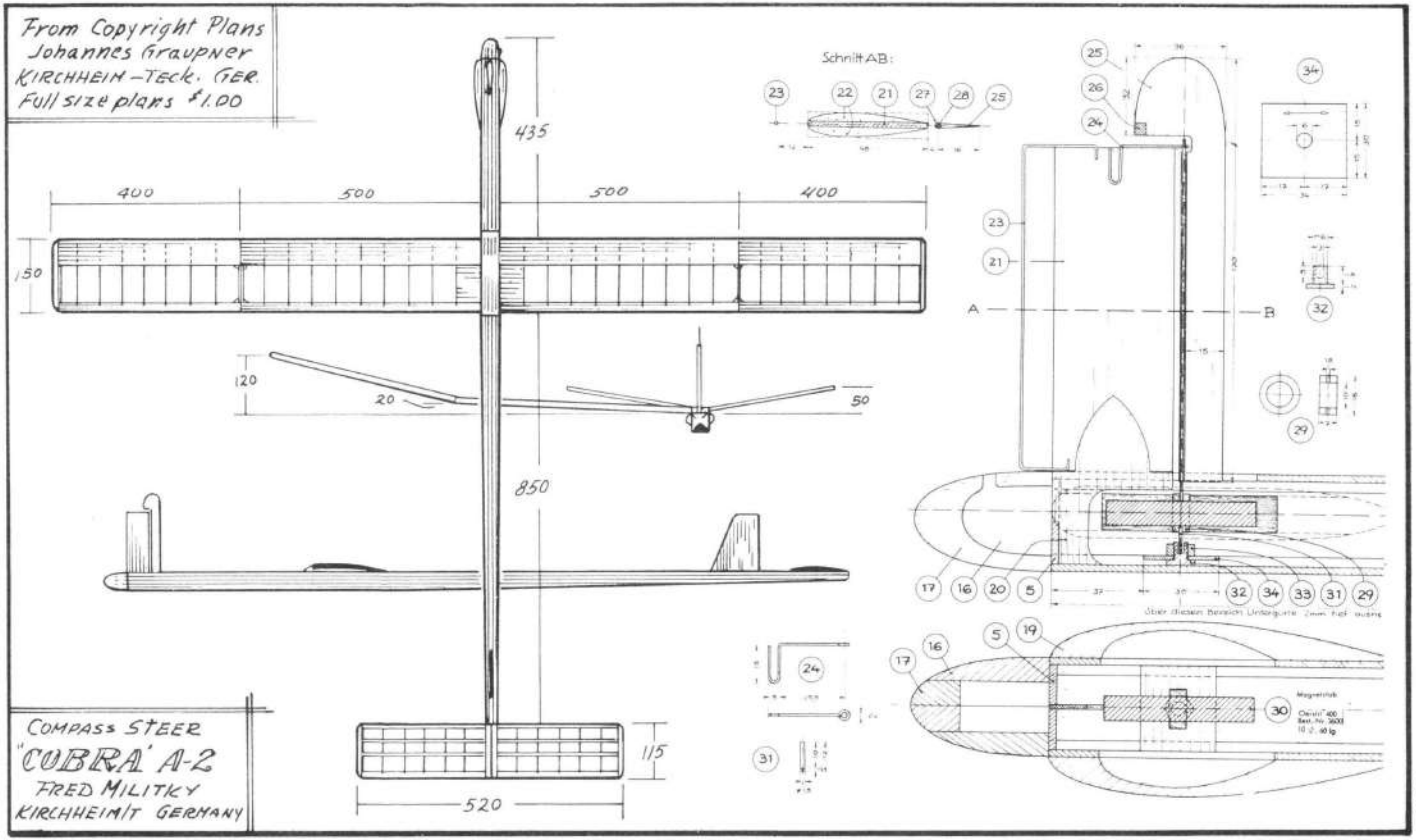
H.L. Glider Launching Technique: For a good launch you need three things:

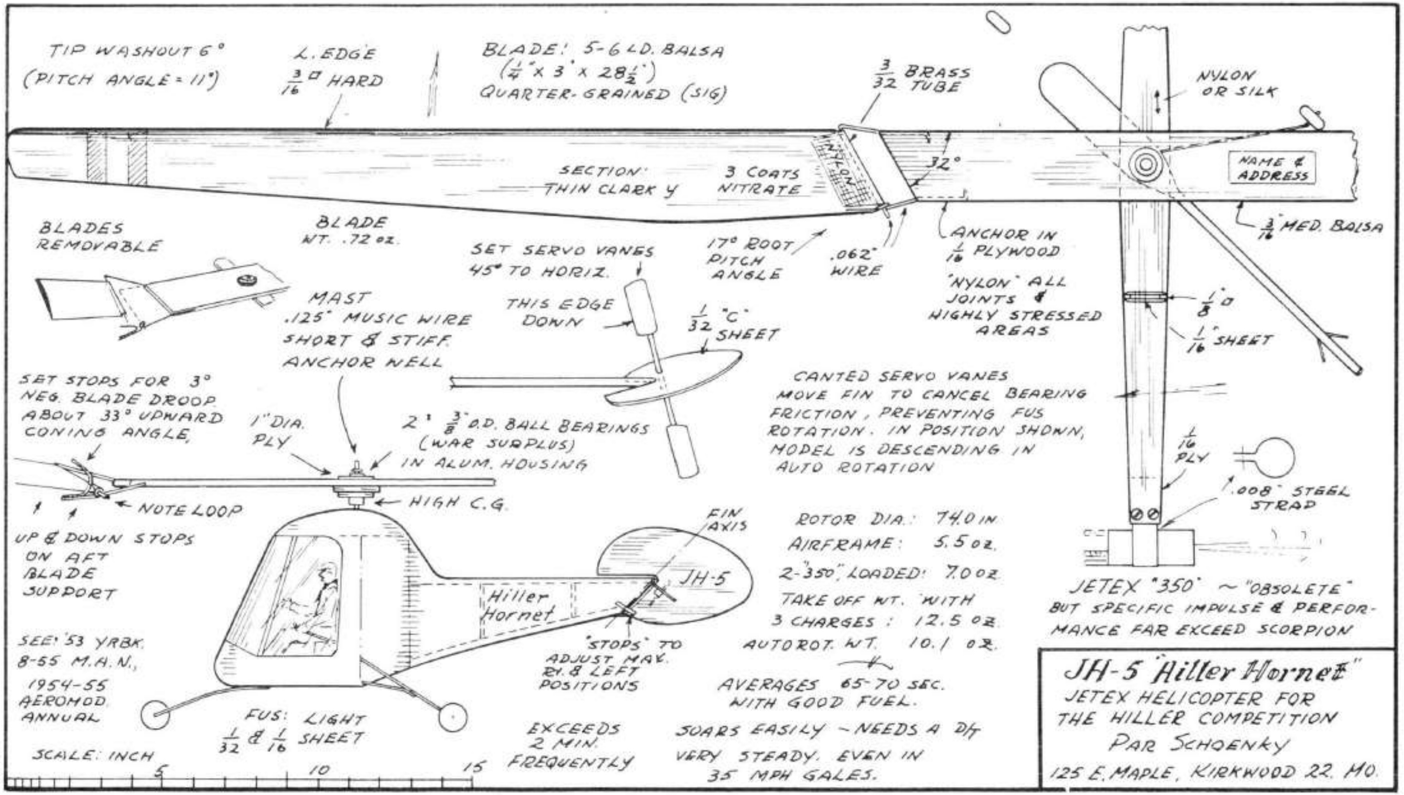
1. The right mental attitude; make yourself think that you can throw HARDER and even HARDER. This is always good for another 25 to 50 feet. More records are set by this than all other things put together. This always makes the difference between 1st and 2nd place.

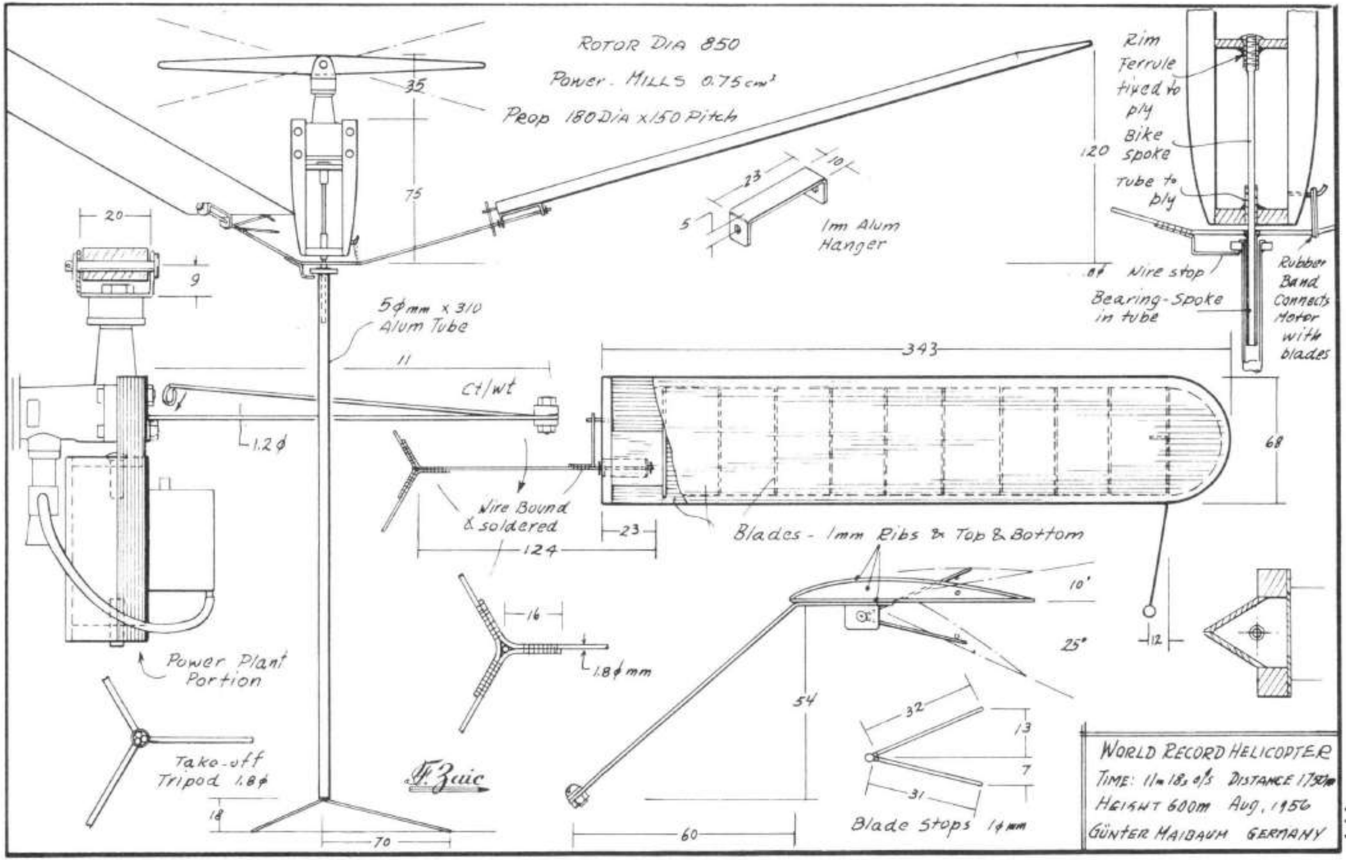
2. A good glider. As far as I know there are only about three good ones around, Foster's, Dagand's and mine. Workmanship makes the big difference.

3. Good physical shape. Do push-ups until you can do 50. Then start swimming, at least 5 miles a week to lengthen your arm muscles. At the same time keep doing the push-ups but only 25 at a time, and do these 25 as fast as you can. About three months before the meet, start throwing tennis balls for an hour or so a day. It is with the aid of the tennis balls that you really develop a launching technique. This sounds like a lot of work; it is. But if you want to do over 1m20s indoors, you just about have to do all of this.

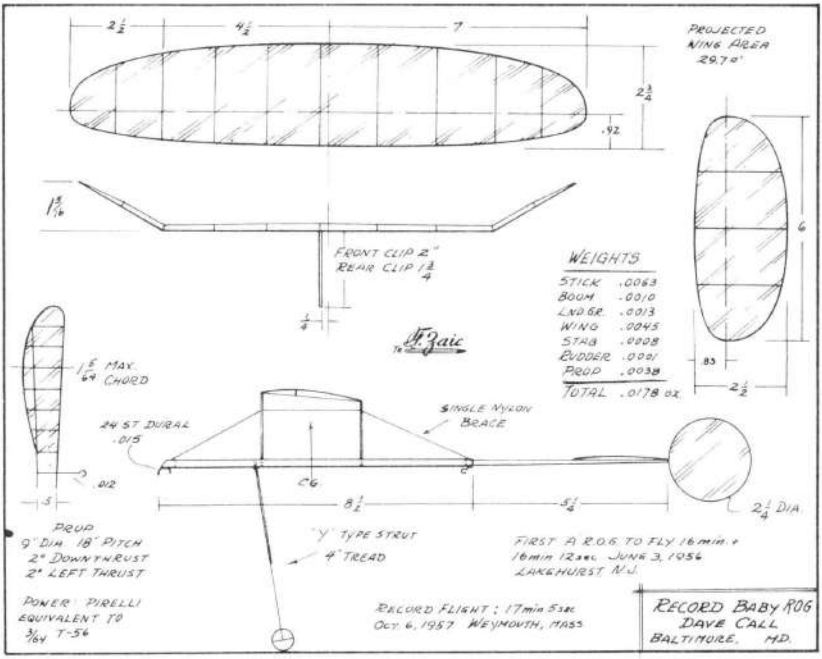
I cannot tell you much about the airfoil used on my glider. You will just have to take my word for it that it is good.—It is a lab tested product. Tests seem to indicate that this type of airfoil is very good for hot free flight jobs, having almost no lift at high speeds, but have glide characteristics as good as any other airfoils. The theoretical high point should be at 30.06% on all airfoils of this type, but the thickness may be varied.

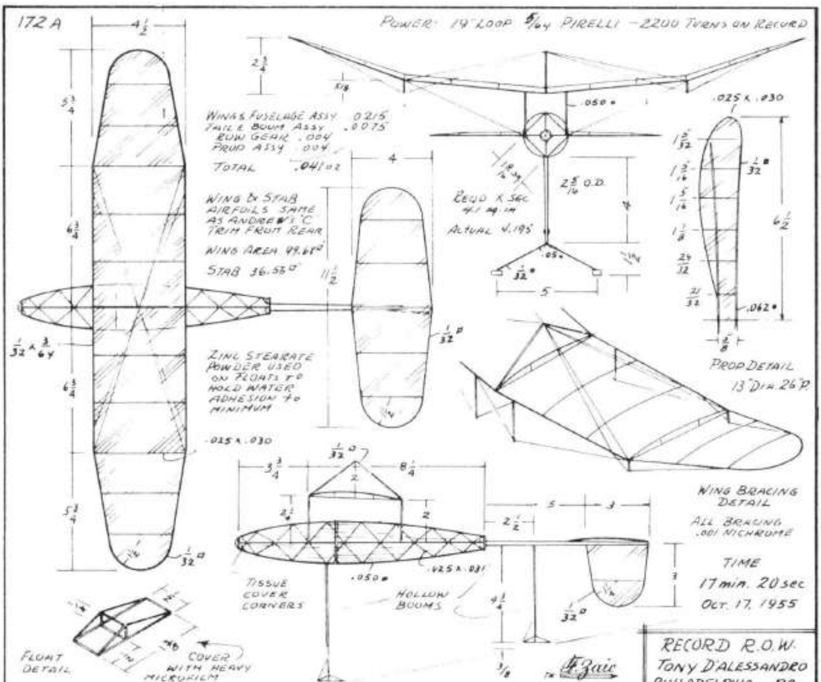

From Copyright Plans
Johannes Graupner
KIRCHHEIM-TECK. GER.
Full size plans $1.00
Schnitt AB:
435
400
500
500
400
150
120
20
50
850
115
520
A
B
COMPASS STEER
"COBRA" A-2
FRED MILITKY
KIRCHHEIM/T GERMANY

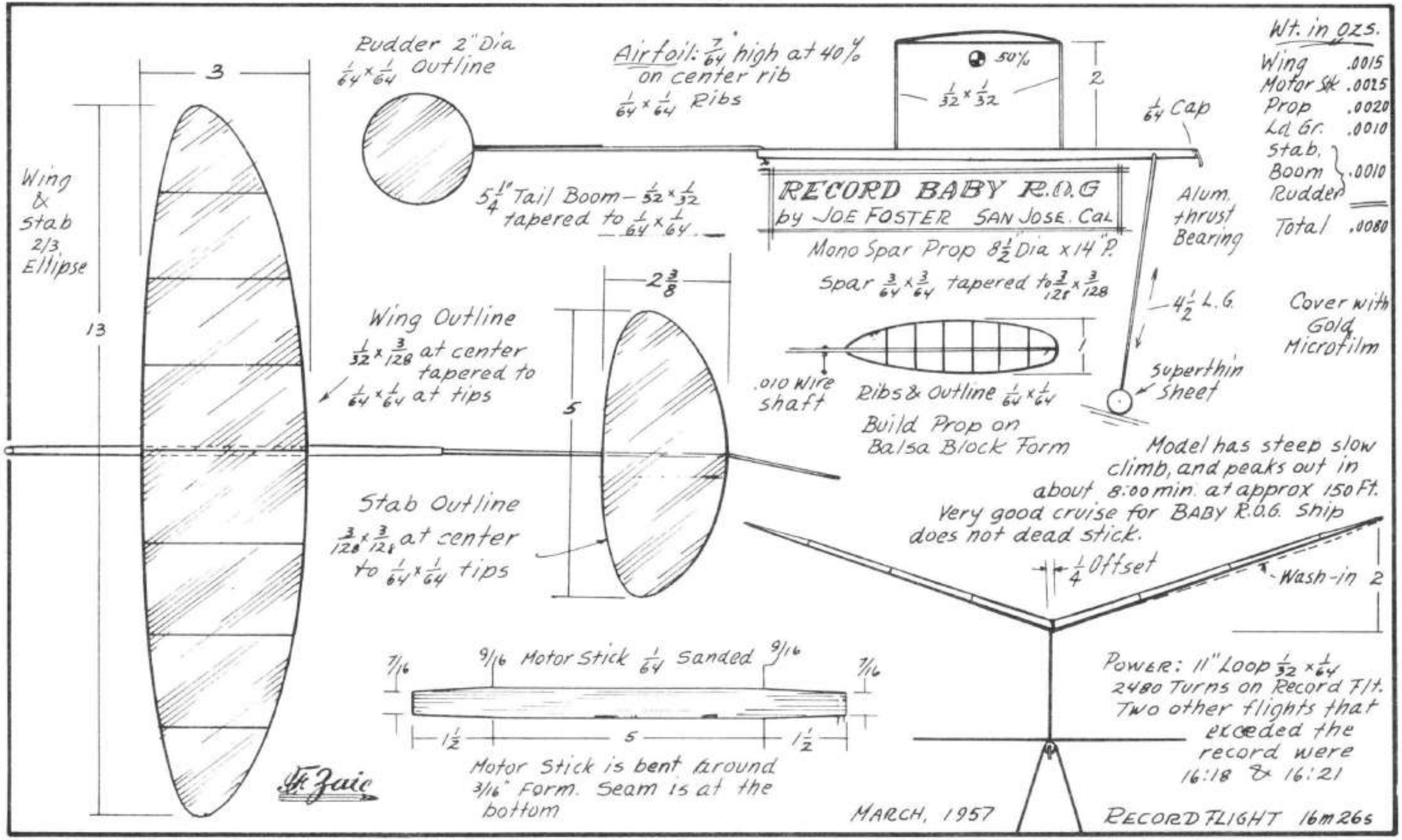

TIP WASHOUT 6°
(PITCH ANGLE = 11°)
L. EDGE
3/16 □ HARD
BLADE: 5-6 LD. BALSA
(1/4" x 3" x 28 1/2")
QUARTER-GRAINED (SIG)
3/32 BRASS TUBE
NYLON OR SILK
NAME & ADDRESS
SECTION: THIN CLARK Y
3 COATS NITRATE
NYLON
32°
BLADES REMOVABLE
BLADE WT. .72 oz.
17° ROOT PITCH ANGLE
.062" WIRE
ANCHOR IN 1/16 PLYWOOD
3/16 MED. BALSA
SET SERVO VANES 45° TO HORIZ.
THIS EDGE DOWN
1/32 "C" SHEET
MAST .125" MUSIC WIRE SHORT & STIFF. ANCHOR WELL
"NYLON" ALL JOINTS & HIGHLY STRESSED AREAS
1/8 □
1/16 SHEET
SET STOPS FOR 3° NEG. BLADE DROOP ABOUT 33° UPWARD CONING ANGLE.
1" DIA. PLY
2 3/8" O.D. BALL BEARINGS (WAR SURPLUS) IN ALUM. HOUSING
CANTED SERVO VANES MOVE FIN TO CANCEL BEARING FRICTION, PREVENTING FUS ROTATION. IN POSITION SHOWN, MODEL IS DESCENDING IN AUTO ROTATION
1/16 PLY
.008" STEEL STRAP
NOTE LOOP
HIGH C.G.
UP & DOWN STOPS ON AFT BLADE SUPPORT
FIN AXIS
JH-5
Hiller Hornet
ROTOR DIA.: 74.0 IN.
AIRFRAME: 5.5 oz.
2-"350" LOADED: 7.0 oz.
TAKE OFF WT. WITH 3 CHARGES: 12.5 oz.
AUTOROT. WT. 10.1 oz.
JETEX "350" ~ "OBSOLETE" BUT SPECIFIC IMPULSE & PERFORMANCE FAR EXCEED SCORPION
SEE: '53 YRBK. 8-55 M.A.N., 1954-55 AEROMOD. ANNUAL
"STOPS" TO ADJUST MAX. RT. & LEFT POSITIONS
AVERAGES 65-70 SEC. WITH GOOD FUEL.
FUS: LIGHT 1/32 & 1/16 SHEET
EXCEEDS 2 MIN. FREQUENTLY
SOARS EASILY - NEEDS A D/T
VERY STEADY. EVEN IN 35 MPH GALES.
SCALE: INCH
5
10
15
JH-5 "Hiller Hornet"
JETEX HELICOPTER FOR THE HILLER COMPETITION
PAR SCHOENKY
125 E. MAPLE, KIRKWOOD 22, MO.

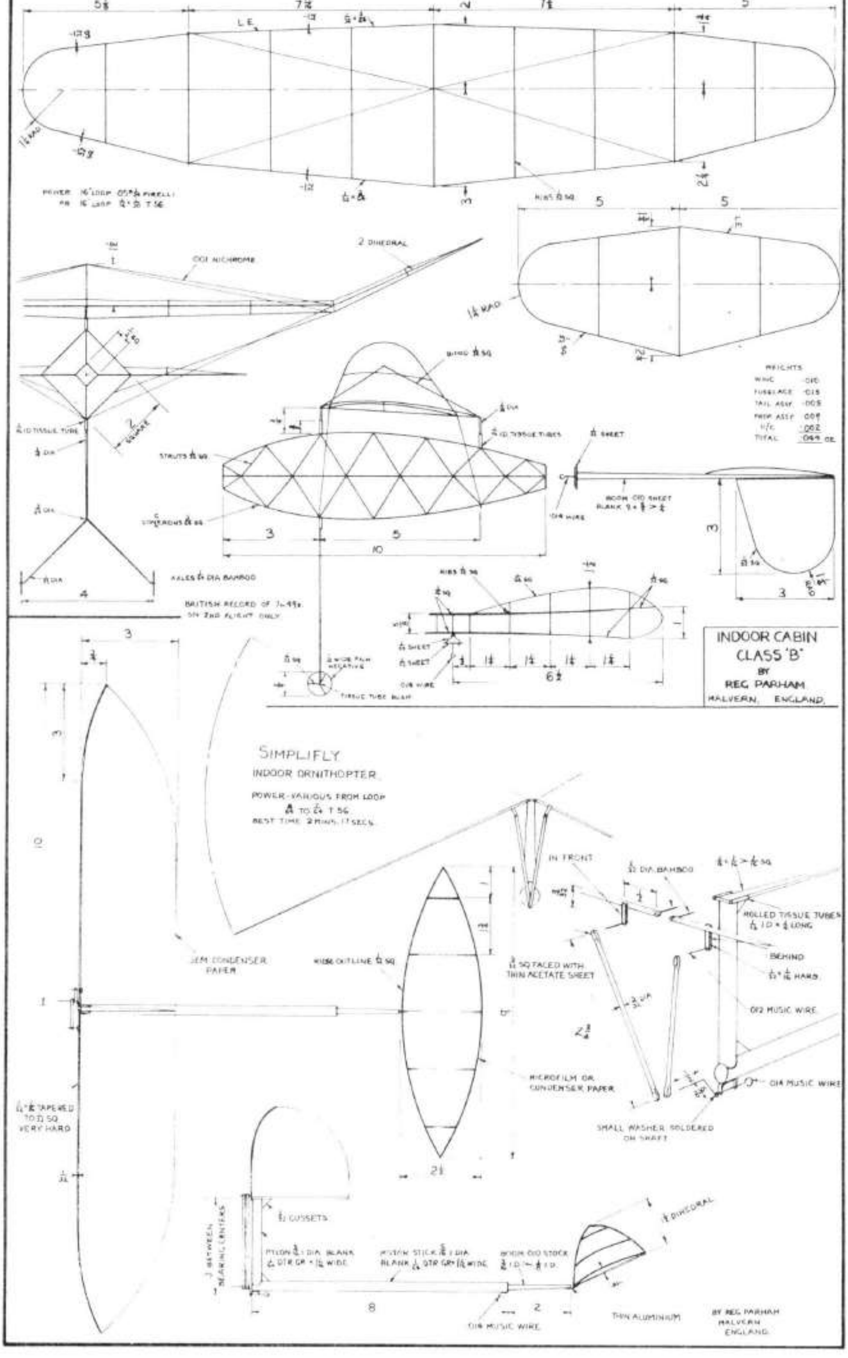


ROTOR DIA 850
Power. MILLS 0.75 cm³
Prop 180 DIA x 150 Pitch
35
75
20
9
5φmm x 310
Alum Tube
11
Ct/wt
1.2φ
Wire Bound
& soldered
124
23
16
1.8φmm
Power Plant
Portion
Take-off
Tripod 1.8φ
18
70
23
10
5
1mm Alum
Hanger
Rim
Ferrule
fixed to
ply
Bike
spoke
120
Tube to
ply
Wire stop
Bearing-Spoke
in tube
Rubber
Band
Connects
Motor
with
blades
343
68
Blades - 1mm Ribs & Top & Bottom
10°
25°
12
54
60
32
13
7
31
Blade Stops 1φmm
F. Zaic
WORLD RECORD HELICOPTER
TIME: 11m 18s o/s DISTANCE 1750m
HEIGHT 600m AUG. 1956
GÜNTER MAIBAUM GERMANY

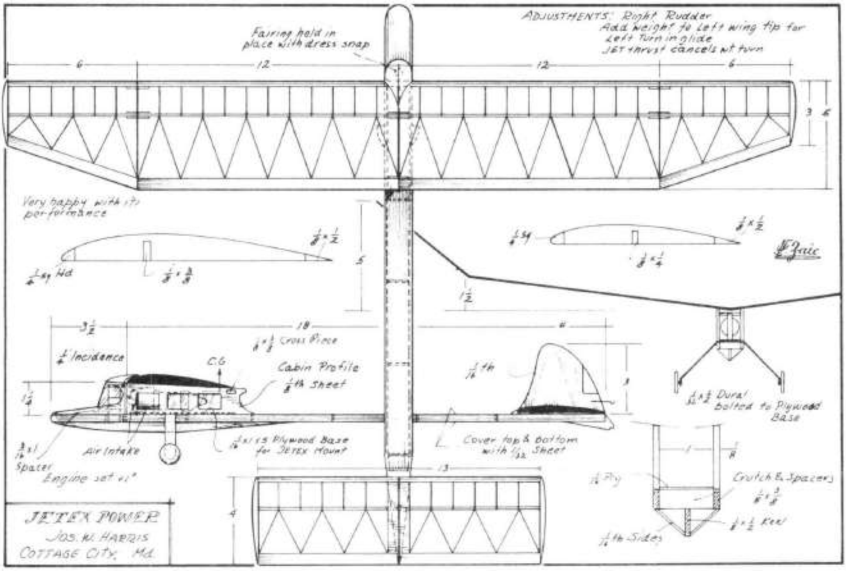

PROJECTED WING AREA 29.7□"
FRONT CLIP 2"
REAR CLIP 1 3/4
WEIGHTS
STICK .0063
BOOM .0010
LND.GR. .0013
WING .0045
STAB .0008
RUDDER .0001
PROP .0038
TOTAL .0178 OZ
1 5/64 MAX. CHORD
SINGLE NYLON BRACE
24 ST DURAL .015
CG
PROP
9" DIA. 18" PITCH
2° DOWNTHRUST
2° LEFT THRUST
"Y" TYPE STRUT
4" TREAD
FIRST A R.O.G. TO FLY 16 min.+
16 min 12 sec JUNE 3, 1956
LAKEHURST N.J.
POWER: PIRELLI EQUIVALENT TO 3/64 T-56
RECORD FLIGHT: 17 min 5 sec
OCT. 6, 1957 WEYMOUTH, MASS
RECORD BABY ROG
DAVE CALL
BALTIMORE, MD.

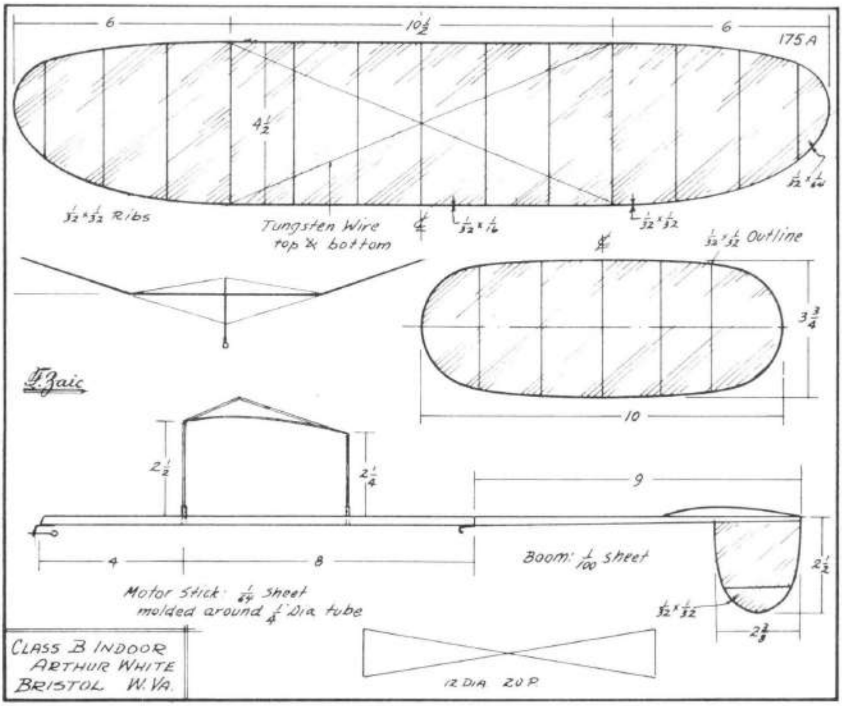

172 A
POWER: 19" LOOP 5/64 PIRELLI - 2200 TURNS ON RECORD
WING & FUSELAGE ASSY .0215
TAIL & BOOM ASSY .0075
ROW GEAR .004
PROP ASSY .004
TOTAL .041 oz
WING & STAB AIRFOILS SAME AS ANDREW'S "C" TRIM FROM REAR
WING AREA 99.68□"
STAB 36.58□"
REQD K SEC
ACTUAL 4.195
2 5/16 O.D.
PROP DETAIL
13" DIA. 26" P.
ZINC STEARATE POWDER USED ON FLOATS TO HOLD WATER ADHESION TO MINIMUM
WING BRACING DETAIL
ALL BRACING .001 NICHROME
TISSUE COVER CORNERS
HOLLOW BOOMS
FLOAT DETAIL
COVER WITH HEAVY MICROFILM
TIME
17 min. 20 sec
OCT. 17, 1955
RECORD R.O.W.
TONY D'ALESSANDRO
PHILADELPHIA PA.

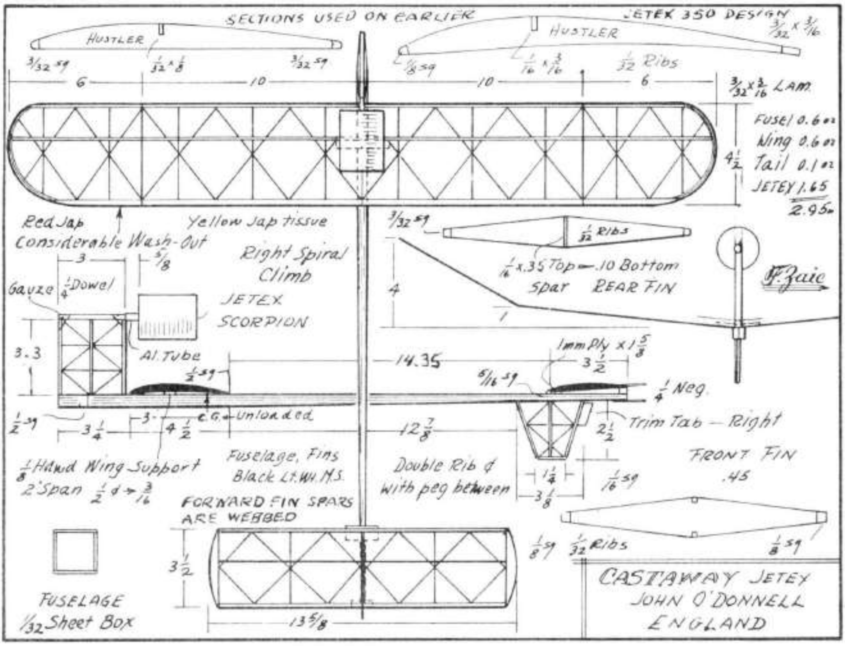

Rudder 2" Dia
1/64 x 1/64 Outline
Airfoil: 7/64" high at 40% on center rib
1/64 x 1/64 Ribs
50%
1/32 x 1/32
2
1/64 Cap
Wt. in ozs.
Wing .0015
Motor Stk .0025
Prop .0020
Ld. Gr. .0010
Stab. Boom Rudder .0010
Total .0080
3
Wing & Stab 2/3 Ellipse
13
5 1/4" Tail Boom — 1/32 x 1/32 tapered to 1/64 x 1/64
RECORD BABY R.O.G
by JOE FOSTER SAN JOSE. CAL
Alum. thrust Bearing
Mono Spar Prop 8 1/2 Dia x 14" P.
Spar 3/64 x 3/64 tapered to 3/128 x 3/128
2 3/8
4 1/2 L.G.
Cover with Gold Microfilm
Wing Outline
1/32 x 3/128 at center tapered to 1/64 x 1/64 at tips
5
.010 Wire shaft
Ribs & Outline 1/64 x 1/64
Build Prop on Balsa Block Form
Superthin Sheet
1
Model has steep slow climb, and peaks out in about 8:00 min. at approx 150 Ft.
Very good cruise for BABY R.O.G. Ship does not dead stick.
Stab Outline
3/128 x 3/128 at center to 1/64 x 1/64 tips
1/4 Offset
Wash-in 2
7/16
9/16 Motor Stick 1/64 Sanded 9/16
7/16
1 1/2
5
1 1/2
Power: 11" Loop 1/32 x 1/64
2480 Turns on Record Flt.
Two other flights that exceded the record were 16:18 & 16:21
Fk Zaic
Motor Stick is bent around 3/16" Form. Seam is at the bottom
MARCH, 1957
RECORD FLIGHT 16m 26s

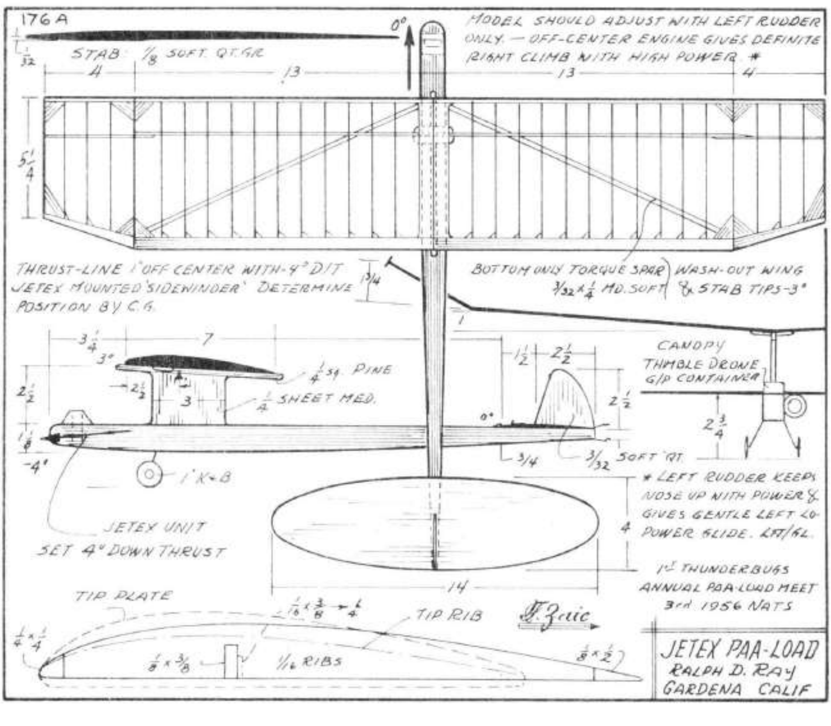


L.E.
2 DIHEDRAL
RIBS 1/16 SQ.
WEIGHTS
INDOOR CABIN
CLASS 'B'
BY
REG. PARHAM
MALVERN, ENGLAND.
SIMPLIFLY
INDOOR ORNITHOPTER
IN FRONT
BEHIND
ROLLED TISSUE TUBES
MICROFILM OR CONDENSER PAPER
SMALL WASHER SOLDERED ON SHAFT
THIN ALUMINIUM
BY REG. PARHAM
MALVERN
ENGLAND


ADJUSTMENTS: Right Rudder
Add weight to left wing tip for Left Turn in glide
JET thrust cancels wt turn
Fairing held in place with dress snap
Very happy with its performance
Cabin Profile
Incidence
C.G.
Air Intake
Spacer
Engine set
Plywood Base for JETEX Mount
Cover top & bottom
Dural bolted to Plywood Base
Crutch & Spacers
Keel
Sides
JETEX POWER
JOS. W. HARRIS
COTTAGE CITY, Md.


175 A
Ribs
Tungsten Wire top & bottom
Outline
Boom: $\frac{1}{100}$ sheet
Motor Stick: $\frac{1}{64}$ sheet molded around $\frac{1}{4}$ Dia tube
12 DIA 20 P.
CLASS B INDOOR
ARTHUR WHITE
BRISTOL W. VA.

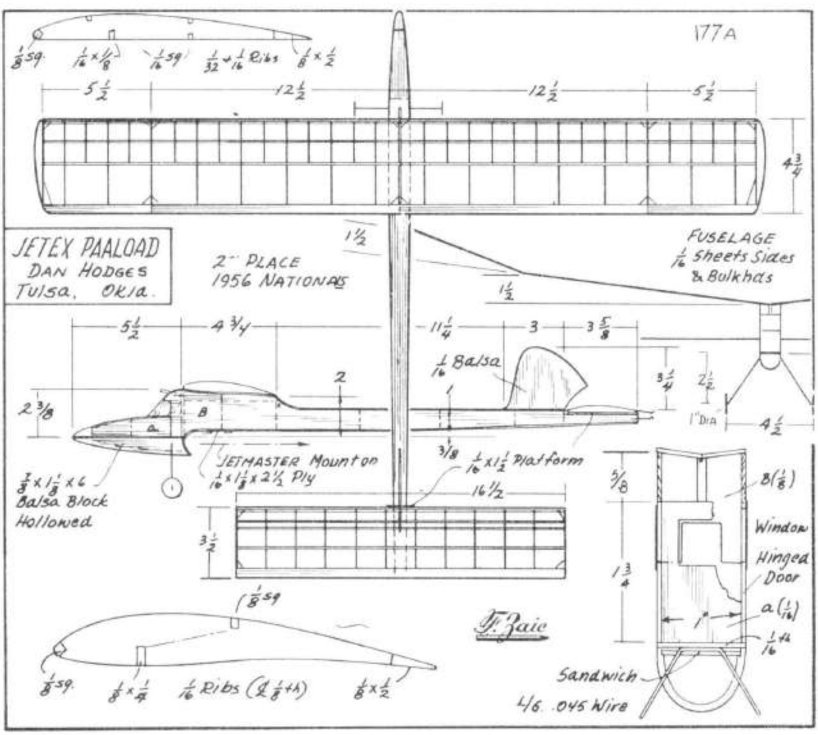

SECTIONS USED ON EARLIER
JETEX 350 DESIGN
HUSTLER
HUSTLER
Red Jap
Considerable Wash-Out
Yellow Jap tissue
Right Spiral Climb
Gauze
JETEX SCORPION
Al. Tube
FUSE 0.6 oz
Wing 0.6 oz
Tail 0.1 oz
JETEX 1.65
2.95
Spar REAR FIN
Trim Tab — Right
FRONT FIN .45
C.G. Unloaded
Hand Wing Support
Fuselage, Fins Black Lt.Wt. M.S.
Double Rib with peg between
FORWARD FIN SPARS ARE WEBBED
FUSELAGE
1/32 Sheet Box
CASTAWAY JETEX
JOHN O'DONNELL
ENGLAND


176A
STAB 1/8 SOFT QT.GR.
MODEL SHOULD ADJUST WITH LEFT RUDDER ONLY. — OFF-CENTER ENGINE GIVES DEFINITE RIGHT CLIMB WITH HIGH POWER. *
THRUST-LINE 1" OFF CENTER WITH 4° D/T
JETEX MOUNTED 'SIDEWINDER' DETERMINE POSITION BY C.G.
BOTTOM ONLY TORQUE SPAR 3/32 x 1/4 MD. SOFT
WASH-OUT WING & STAB TIPS-3°
1/4 sq. PINE
1/4 SHEET MED.
CANOPY
THIMBLE DRONE G/P CONTAINER
3/32 SOFT QT.
1" K+B
JETEX UNIT
SET 4° DOWN THRUST
* LEFT RUDDER KEEPS NOSE UP WITH POWER & GIVES GENTLE LEFT LO-POWER GLIDE. LFT/GL.
1st THUNDERBUGS ANNUAL PAA-LOAD MEET 3rd 1956 NATS
TIP PLATE
TIP RIB
1/16 RIBS
JETEX PAA-LOAD
RALPH D. RAY
GARDENA CALIF

JETEX POWER MODELS by Dan C. Hodges Tulsa, Okla.

The Jetex PAA load was made last summer about a month before the '56 Nationals and was test flown to my satisfaction on a calm day here. This undoubtedly contributed to my partial success at the Nats as most of ships entered (with one or two notable exceptions) had apparently never even been test flown. Another point—most of the entries that I watched had trouble with ROG's which was probably due to improper landing gear location. My ship did get the highest ROG time at the Nats, and I can honestly say that I have never had any trouble in getting the ship to take off. In fact I have found that ROG's are easier than hand launch due to the fact that the timing of the HL is most important with Jetex. A ship of this design built by Tom McDonald of Tulsa won 1st in the Glue Dobbers 7th Annual meet last Labor Day weekend.

I am also including plans for my "Tow Nail" Nordic Glider. This is a straightforward, easy-to-build design that has excellent towing characteristics. I have built three Tow-Nails and a number of others have been built in this area.



You also asked for opinions on another one of my favorite events —Free Flight Scale. I was glad to see the recent rules changes go into effect which judge the flight on points for realism rather than the ratio system on endurance. I believe that the FF Scale model should fly like its real counterpart as well as look like it. The Bellanca Columbia that placed 3rd in the '56 Nats had a level realistic take-off and a gradual climb to the left. I had test flown it too before taking it to Dallas so I was reasonably sure of what it would do. On the selection of the model for this event, I like the fabric covered vintage aircraft because it lends itself so well to scale model construction. The Bellanca had exact scale wing and tail rib spacing as well as fuselage construction. I am working up plans now for the 1928 Eaglerock. To sum this up we can set up two categories: Features I Look For in a scale model and Points To Avoid.

In a scale model I look for these features:

1. Construction that lends itself modeling.

2. A ship that you can back up with adequate plans and material. An unusual plane is okay provided you can prove it is authentic.

3. A Landing gear that will adapt itself to a rearward shock load instead of the normal spread type.

4. An engine cowling that will permit a buried model engine.

5. Knock-off wing panels. This is a most important feature and is well worth the extra effort.

I try to avoid these points:

1. Monococque construction, or unpainted metal covered frame-

2. Non-shock mounted landing gear.

3. Exposed radial engine detail.

4. Complex wing strut and flying wire detail.

5. Fast flying planes of small area and high loading.

6. Extensive interior detail (i.e. You must include all the interiors the real plane had, so choose a subject with a minimum of insides).

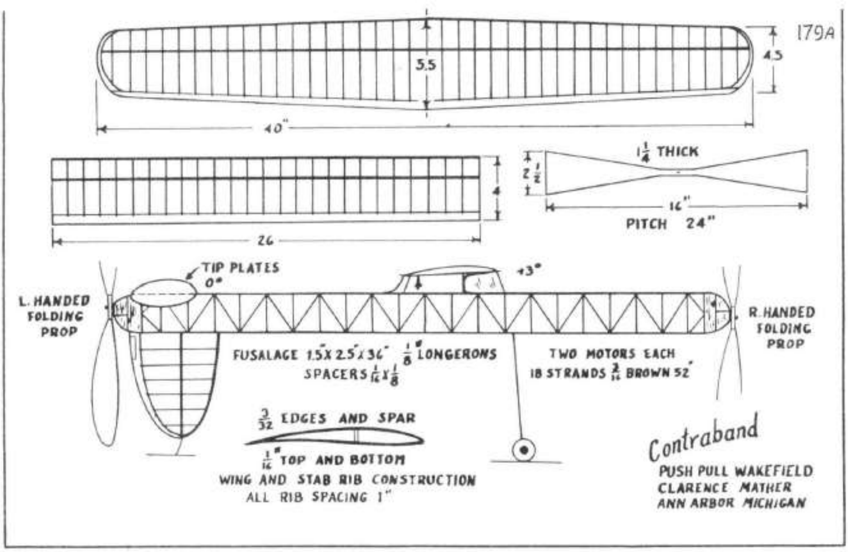
As to size I try to stay with 1 inch to the foot if I can. It gives a model of about 36 to 48 inches span which is about right. To be able to fly with a scale prop on a model this size necessitates a larger engine than the usual 049. The 1 cc diesel really fills the bill for scale in my opinion. It turns the big prop and can be regulated better than the glow engine. At the '56 Nats at Dallas in the hot weather we had I had absolutely no trouble with the David Andersen .06 diesel turning the scale 9 inch prop while others with enclosed glow engines were suffering from overheating and blown glow plugs.

DESIGNING PUSH-PULL MODELS by Clarence Mather

During the early 1950's when there was no rubber limit on Wakefield models we decided to try push-pull designs. We were prompted by the facts that counter-rotating props could be used to cancel torque effects and that two smaller motors could be used in place of a single large one. These were not small considerations since it was planned to use about six ounces of rubber.

Accordingly a model was built with a left-handed prop at the rear and a right-handed one at the nose. The prop diameters were sixteen inches and the pitch was twenty-four inches. The motors ran the full length of the fuselage and consisted of sixteen strands of three-sixteenths brown rubber fifty-two inches long. The fuselage was thirty-six inches long so there was a lot of slack.

Obviously such a fuselage will balance at its middle which brings up the main problems with push-pulls. When the stab and fin are added to the rear the balance point is moved still farther back. If conventional surface areas are used the wing is placed somewhere over the balance point. The nose of such a model is then longer than the rest of the model! The stab and fin then have to exert a large force to stabilize the weight and side area of such a long nose. We used a large stab equal to fifty-five percent of the wing area. This arrangement allowed the wing to be moved somewhat forward of its usual spot and would provide more than the usual dampening effect at the tail. For the first flights the wing was placed with the trailing edge about one inch in



front of the balance point. However the model was not stable until the wing was moved back about two inches. And this location was probably marginal for when the model was flown at full winds in windy weather it was not stable during the power burst. This quirk did not show up until the model was flown in contests however.

At first large tip plates were placed on the stab and a single fin was mounted underneath the fuselage. It was placed underneath so as to hold up the rear of the fuselage during takeoffs giving clearance to the rear prop. Directional stability was not good however and the tip plates were reduced to a minimum and a large single fin taking their place on the fuselage.

There were other troubles during this trimming period. The front prop blades persisted in catching on the blunt top of the fuselage instead of folding properly. Of course this upset the glide turn trim and usually spun the model down. Stronger prop tensioning springs were installed and the nose was rounded off as much as possible. We then had no more trouble with the blades catching improperly. At first the rubber would be knotted unevenly for the glide and thus the trim was not the same for a series of flights. By carefully adjusting the tensioner catch screw the prop was stopped with an even row of knots in the motors. This was accomplished with only two or three trials and then worked consistently. Looking back this isn't at least a little surprising.

All of this adjusting required a considerable period of time. However once the wing position was properly set the model was a good climber. The absence of torque was obvious in the model's steadiness during the climb. It was circled to the right in the climb and glide. Some side and down thrust were added to the right rudder to produce a nice climb circle. The model's glide was satisfactory although most observers felt it was not up to some of the better ones. The motors would take 1800 turns each which gave a prop run of about 1:50. For winding it was convenient to have three people. One sort of steadied the model while the other two wound the motors simultaneously. We wound the peg end of the motors which speeded things up. Fixed gear were used since both hands were occupied with a prop while preparing for takeoff. This model took second place at the 1951 Wakefield semi-finals at Chicago. The three flight total was something over ten minutes.

The large amount of slack seemed wasteful so a new fuselage was built. It was forty-two inches long and tight motors were used. Larger diameter and higher pitch props were substituted. The model seemed sluggish with the new props however and as time was short the old ones were placed back on the model. The model was very peppy and gained good altitude although the prop run was reduced to about 1:10. The model was flown with full power in a variety of weather in preparation for the 1952 trials. The trials were held during a drizzle and apparently a warp developed. Trim regressed until the model dove in on the third flight.

A completely new model was built. This had a fuselage similar to the last but the stab was only equal to thirty-three percent of the wing. The oversize stab of the other model had not allowed the wing to be forward very much and we felt a better glide might ensue from the larger wing. Unfortunately this model was tested very little and was wound full at the 1953 trials in sort of a desperate attempt. It dove in. This was probably due to the balance point being too far back. It has taken us a long time and some hard knocks to fully respect the fact that there is a limit to how far back on the wing a model can be balanced!

With so little experience we hesitate to draw any firm conclusions about push-pulls. They are interesting models and will fly well. We are by no means certain that they can out-fly or even hold their own with the modern tractor design. With the rubber limit on Wakefields they are not practical for that event. They are practical for the A.M.A. unlimited rubber powered class. The long nose problem can be at least partially solved by ending both motors some six or eight inches from the rear of the model. A long prop shaft can transmit the torque to the rear prop. Thrust adjustments would have to be made on the front prop only but this would be sufficient since only small angles were required.

DESIGNING CANARD MODELS

Clarence Mather

A canard airplane has the stabilizer located in front of the main lifting surface and usually has the fin and propeller at the rear. Many people are surprised to learn that most of the first airplanes, including the Wrights', were canards. And canards are not extinct for several of the present day missiles such as Bell Aircraft Rascal and North American Aviation's Navaho are tail firsters.

We have built about fifteen rubber powered canard models during the last twelve years. We have by no means explored them fully but we have found them consistant in some respects. These notes are based on flight observation only and thus not on precise experiments. So there is plenty of room for error!

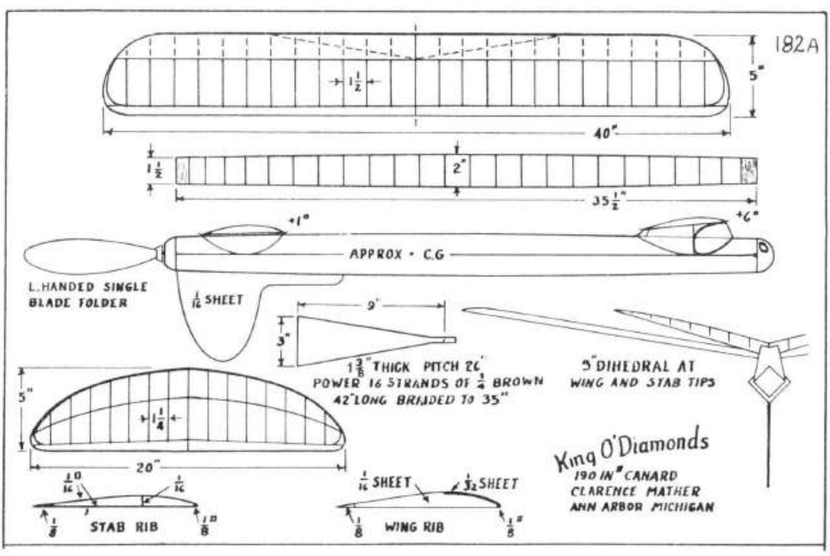
The general overall performance and stability of canards seems to be about equal to that of conventional tractor models. The canard appears to outclimb a tractor and is more stable during the climb. The glide of our best canards was as good as our best tractors. We found some definite limits exist if a good glide is to be obtained, however.

The pusher prop may account for part of the canard's good climb. Drag may be lessened because the high velocity prop blast does not have to pass over the rest of the model as it does on a tractor. Also the lifting surfaces may perform more efficiently in the undisturbed air. However the pusher prop enters turbulent air. Presumably this is not as detrimental as having the prop blast strike the model.

The stabilizer function at a relatively high angle of attack on our canard models and this seems to keep the nose up throughout the prop run. Thus full benefit of the rubber's energy may be obtained. In contrast many tractors level off and cruise during the latter part of the power run.

The canards were quite spirally stable. Too much side thrust or rudder would spiral them in but they usually gave ample warning. We trimmed for a left climb and glide circle. This climb is against torque because we used left handed props which could be wound up in the conventional direction. A climb with torque was used several times but trim was more difficult—particularly on high powered models. Some left rudder was necessary to produce the desired glide circle and two or three degrees of left thrust were usually added to tighten up the climb spiral. On higher powered models some down thrust was used to keep the climb from being too steep.

The glide of our canards was not as easily trimmed as the climb. The stabilizers were equal to about one-third of the wing area. We did not experiment with different size stabs. The stabs had three degrees more incidence than the wing built into them. However after checking several trimmed models we found they usually had five or six degrees more incidence than the wing. It would seem that the models with the



least amount of angular difference would be most efficient. However longitudinal stability was not good until the stab had a considerable amount of incidence. This decalage is necessary to insure the stab's stalling before the wing. If a model noses up to steeply for flight the forward lifting surface should stall first. The nose will then drop and the model will gain flying speed quickly. If the rear lifting surface stalls first the tail of the model will drop and a whipstall results followed by a huge drop. A canard's good stall recovery characteristics are probably due to the fact that the wing is still lifting in a stall and this keeps the model from dropping very far. We are assuming of course that the model is trimmed properly or nearly so. A tractor model's wing stalls first and this is a much greater part of the total lifting than is the stab. Thus it would seem that a tractor would drop farther before recovering from a stall.

We found that the fuselage length has a maximum value—remembering we did not try various size stabs. A few years ago when there was no power limit on Wakefields we tried a long fuselage canard. For testing we built a small model. It had a thirty inch span and 115 square inches of wing area. The fuselage was forty-four inches long and it carried a tight motor consisting of ten strands of one-fourth inch brown rubber. A sixteen inch prop was used. The model climbed like an arrow and we thought we had something until the glide refused to stabilize in spite of any and all adjustments.

The slightest rough air would cause the model to stall. However small this first bounce would be a long swoop followed with a large loss of altitude. Obviously the long moment of the rubber motor was too much for the stab to dampen quickly. The wing was enlarged to 145 square inches of area and a thirty-six inch span. The stab was enlarged proportionally. The model was then quite stable in fairly smooth air and has made thermal flights up to seven minutes duration. However if it is windy and the air turbulent the model still develops a swooping glide and sinks rapidly. As a general rule we concluded that the fuselage should not be longer than the wing. Our models meeting this condition have good stability even in very rough air.

It is a good idea to use tight motors in canards. Slack motors can be braided so they are effectively tight. Uneven knotting of the motor will upset the balance of the model and ruin the glide. We used to use lots of loose slack and hope a double row of knots would form evenly along the motor. Usually they did but occasionally they would not and the model would stall or dive. Of course this will happen during a contest flight! If an extremely long motor is desired gears would be a good solution we believe. Thusly the fuselage could be kept quite short as seems to be necessary for stability.

Fin area was very important on our canards. We used folding props and the rearward folded blades had a fin and rudder effect of their own. Invariably we had to use a fin equal to about fifteen percent of the wing area. Even then directional stability was marginal. However this probably worked to an advantage for the canards soared very well. They seemed to wheel into a thermal easily and stay there. If the prop blades flopped around instead of folding properly the models would rock or even spin until the blades did stop. Thus a sure fire tensioner is necessary for folding props. We used small blocks on the prop hub to stop the folding blades in the best streamlined position and a small rubber band to hold them there. Forward folding blades were considered but they would not fit snuggly against the fuselage. A single blade could be folded rearward and around 270 degrees to fit against the opposite side of the fuselage. It would then make a neat fit. We did not figure out a satisfactory hinging system for this method. A free-wheeling prop would by-pass tensioning and folding problems and should make it possible to reduce fin areas substantially. Drag at the rear of a model has a stabilizing effect. It would seem that the increased drag would increase the sinking rate but perhaps not very much if small diameter high pitch props were used. Several modellers have flown canards of this type but we don't know how their glides compared with tractors.

We found that a single fin mounted under the fuselage gave by far the best stability. There have been pictures of canards with the fin on top of the fuselage yet every time we tested that set up the model lacked directional stability! On one model the fin area was increased until it was equal to one-third of the wing area and still the ship zig-zagged all over the sky. When the fin was taken off the top of the fuselage and placed underneath it could be reduced to the usual size. Obviously there must be some basic difference between our canards and the ones described. We thought that a topside fin might be in the turbulent wake of the stab but the other models had a similar stab location. Curiously enough we recently met a modeler who had the same results as we did with top mounted fins on canards.

Twin fins slung under the wing at various distances from the fuselage were tried on several canards. In every case each fin had to be nearly fifteen percent of the wing area.

The need for a large fin seems reasonable when the center of gravity and fuselage side area are considered. Our canards balanced about one-third of the distance from the wing to the stab which was a little less than half way from the rear of the fuselage to the nose. Thus the lever arm of the fin is short and a large area is necessary to exert a sufficient stabilizing force. Also there is more side area in front of the balance point than there in behind and this is an unstable condition. The fin must counter balance front area. In designing canards it is well to keep the side area in the front part of the fuselage to a minimum. Some canards have the stabs mounted on wire frames rather than a pylon. We use small cabins without appreciable bad effects. One model started out with a high cabin under the stab and it definitely needed a larger fin. The cabin was shortened later and the model showed considerably more directional stability.

As mentioned earlier the balance point of our canards was about one third of the distance from the wing to the stab. The procedure followed was to complete the wing, stab and fuselage except for the wing and stab mounts. The rubber and prop were installed and the wing and stab were laid on the fuselage in their approximate positions. The surfaces were moved about and the balance point checked after each move until the described set-up was realized. We usually kept the surfaces near the ends of the fuselage which resulted in a large distance between them. The wing and stab mounts were then built at the proper locations. Glide testing showed what incidence adjustments were necessary.

We have not flown a gas powered canard. If the engine was mounted at the rear a weight would have to be placed in the nose to bring the balance forward to the proper location. This weight would be quite large. Several radio controlled models have their engines mounted on narrow pylons located behind the wings. This pylon mount could be used to hold the engine of a canard design very nicely. It could be located as to balance the model. Probably this would turn out to be about half way between the wing and stab. We hope to try this arrangement soon. Canard models are well suited to the two events for rubber powered models in the present A.M.A. rules.

Hand launching does away with the possibly troublesome R.O.G. A couple of our canards had takeoff gear but we never actually did an R.O.G. The Wakefield rubber limit allows a fuselage length compatable with stability requirements. The unlimited class having no weight requirements allows a light framework with a large part of a model's total weight in rubber. Perhaps there is a limit to the power that a canard can handle but we have used as much as twenty strands of one-fourth inch brown rubber in a 190 square inch model. That particular model climber well in a spiral against torque but was touchy when we tried to circle it with torque.

We doubt that the glide of a canard with the surface area percentage described here can stand up against the large wing small stab of the newer Wakefields. However it certainly may be possible to use similar percentages on canards. That would seem to be a good field in which to experiment.

WARREN-YOUNG ANTI-STALL WING

by G. Woolls England

It was way back in 1933 that Mr. Norman Hall Warren, an Aerodynamicist friend of mine dreamed up the high lift, stall and spin proof, wing configuration featured on this model. A successful flying model was built at that time, and, in partnership with Mr. Rex Young, patents were granted in 1937 for a passenger carrying aircraft employing the Warren-Young wing.

The outbreak of war in 1939 prevented the construction of the prototype airplane.

Since the war no backing has been forthcoming to finance the full scale example but several small jetex powered models were made and proved very successful.

Although the projected Warren-Young "Skycar" has its pusher prop at the extreme rear, where it does have certain aerodynamic advantages, I preferred to build my version with the propeller between the wing as shown on the drawing, thus combining airscrew protection, minimum undercarriage, and—I think—nice lines.

From the very beginning of test flying the airplane made it plain that it was going to fly and fly well, and after a little experimenting with propeller pitches and gear box ratios fine stable flights soon became regular.

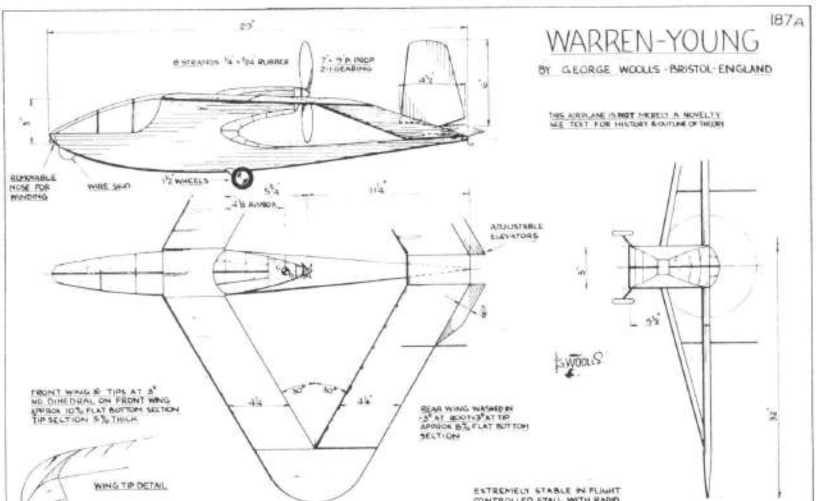
When badly over elevated the resulting stall is quite harmless, being merely an oscillation about a point on the rear wing, and no tendency to drop a wing and spin has ever been noticed.

Warren has written many articles on his wing design and the following extract from the one published in "Flight" of August 10th, 1950 is given in order to give those who have an enquiring nature some idea of the theory behind the layout.

"The gradual stall coupled with maintenance of control will allow the Warren-Young to make landing approaches at maximum lift and therefore at the lowest possible speed in level flight. Moreover, glides and also power-on descents beyond the angle of maximum lift may be a safe flying technique, when the forward speed will be exceptionally low and the aircraft will descend in an almost vertical path.

The relatively high value of C.L. max. derives from the delayed stall, which depends upon the properties of swept wings. A swept-back wing burbles prematurely in the region of the tips, whilst a swept-forward wing has a more delayed stall, which eventually begins near the root. The cause of these effects is as follows. With a swept-back wing the chordwise pressure-pattern is progressively staggered rearward as the tip is approached, which means that, in a spanwise direction, the negative pressure on the upper surface for adjacent chords is greater for the outer chord (except very near to the leading edge) and, therefore, there arises a spanwise pressure-gradient with pressure decreasing towards the tip. This results in an outward drift of the boundary layer which will carry away any stale fluid tending to collect in the inner region of the wing. At the tip, however, there is an inflow due to exchange of pressure from the lower to upper wing surface, and this neutralizes the outward flow, causing fluid to accumulate and resulting in burbling. In addition, sweep-back increases the tip upwash and thus the local angle of attack is increased, aggravating the tendency for an early tip-stall. With a swept-forward wing, on the other hand, by similar reasoning there will be a pressure drop towards the root, resulting in a boundary-layer flow in this direction. But in this case the tip inflow is not opposed to the sweep induced flow; it will increase its energy and thus delay burbling, which will eventually start in, and spread from, the root region. The result is that for the swept-back and swept-forward wing burbling spreads slowly, producing a smooth flat-top lift curve for both wings, but with a higher C.L. Max. for the forward-swept aerofoil.

In the Warren-Young wing, the front swept-back planes are joined via tip surfaces to the rear swept-forward planes and this arrangement will prevent the early tip stall by influencing the boundary flow as follows. The energetic inward flow along the upper surfaces of the rear panes will scour the tip regions and remove stale fluid, which would otherwise give rise to burbling. Also the large relative chord of the tips will cause dilution of the tip upwash and will, therefore, reduce the local C.L. increase induced by the sweep-back. The elimination of the causes of early stalling will result in a linear increase of C.L. being extended to higher angles of attack and thus the attainment of a higher C.L. max., but since not all parts of the wing will be operating at the same effective incidence or will have the same form of chordwise pressure distribution, burbling will not begin simultaneously. Moreover, due to the sweep-induced boundary layer control, the chord-wise spread of the stall will be slow."



PROP LAYOUT & CIRCULAR AIRFLOW

by John Booker —————————————— England

The 1955-56 Edition of the Year Book seems best yet. I was pleased to see various people from over here contributing. I had not seen anything by Robert Burns for years. If Joe Maxwell, the friend he mentioned, is J. H. Maxwell perhaps he would write something for you. His articles on theory and gadgets were always excellent. It was an article of his on Undercarriage Design which appeared in 1945 which spurred me on to use algebraic knowledge, which I was so painfully acquiring at school, to deduce my first aeroplane formula.

I was very interested in slots and flaps and worked out what effect the CL had on the Kinetic Energy of the model. Here is the equation: K.E. $= W^2/32\ \rho$ S CL.

This means that models with thin flat-bottomed wings make deeper holes in the ground than those with high-lift sections. If we combine this formula with Peter Soule's idea on Density Factor we get Kineti Enery $= K^2 S^2/32\ \rho$ CL.

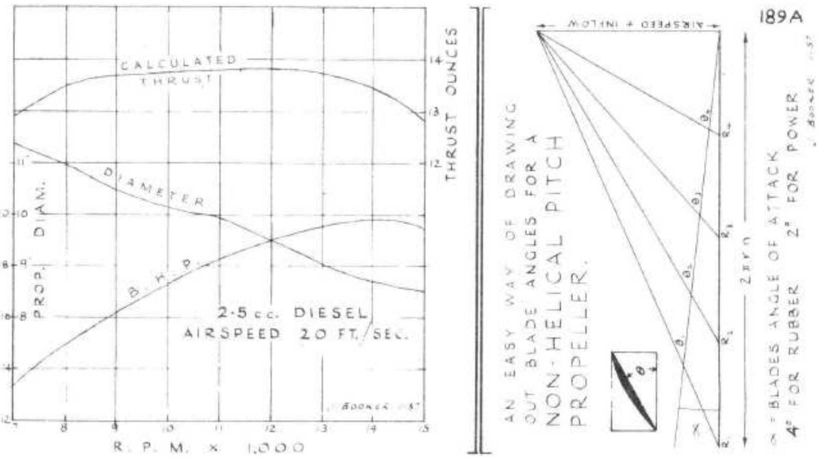
Where K is constant and S equals wing area.

In other words, that 80 inch span R/C job is going to hit you sixteen times as hard as the 40 inch junior version! There ought to be some practical tie-up with this, air wheel sizes and wire gauges for undercarriages.

I suppose I ought to tell you something about myself. I am by no means an expert aeromodeller but I am very interested in the whys and wherefores of aeroplane design and, not being a professional aerodynamicist I have all the fun looking for the answers. I am actually a Municipal Engineer by profession but I think it would be true to say that I have been studying aerodynamics ever since I bought my first "Aeromodeller" just 14 years ago, or perhaps ever since as a nine year old I used to fly "Frog" rubber models and balsa gliders which I bought ready-made in Woolworths. I can still remember reading in my "Comic" that Hollywood Stunt Men do their parachute drops at 11 AM when the air is calmest and then proceeding to fly my models at 11 AM on Saturday mornings! After I left school I started designing models, my younger brother building my first glider design in 1949. This was according to the latest theory and won first prize at the local rally first day out.

My chief interest for the past few years has been in the theory of flying. I joined the L.S.A.R.A. and have read many of their reports. I like formulae but I think your method of working out examples can make things clearer and put them in proper perspective. For instance I do not think the anhedral tail and underfin would show up as well as we might expect if an actual example were worked out.

I have calculated the thrust of a 2.5 c.c. (.15 c. in) diesel for a model flying at 20 ft./sec. (14 M.P.H.) It is based upon published tests which I think give too low results but is interesting in that it shows that, for slow models, propeller diameter is not important so long as it matched by pitch. Any talk of running at peak revs is mistaken at slow flying speeds but this is important at higher speeds of course. Do not blame the low thrust on the diesel, glow-plugs seem to be worse.



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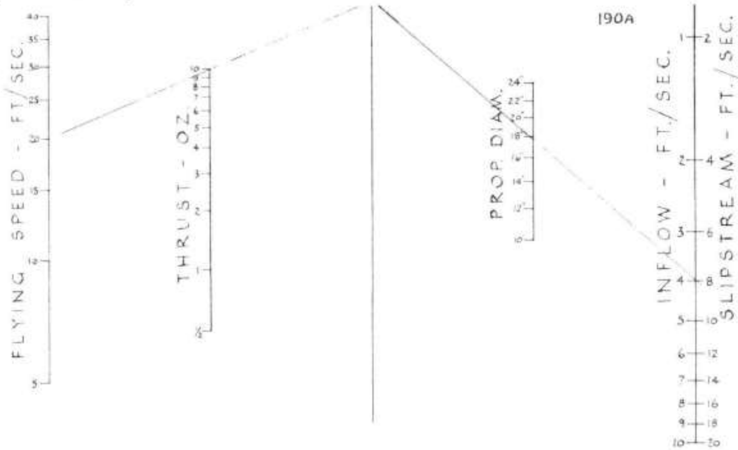
I am also enclosing a method of drawing out propeller angle. The ordinary method does not give the same angle of attack along the blade unless the angle of attack required is zero. I suggest an angle of attack of 2° for power props and 4° for rubber would be about right, this corresponds to angle for L/D maximum at infinite Aspect Ratio. The velocity vectors are drawn in the usual way, using the calculated speed through the airscrew disc for the vertical. My guess is this should vary from the speed of the plane at the hub to a maximum near the tip but I have never seen any figures to support this.

Airspeed is the speed of the plane measured relative to the air. This is used in all aerodynamic equations and is read by a pilot on his A.S.I. The plane's ground speed is of importance mainly to pilots of bombers and airliners and is the distance covered in one hour.

When a model is standing on the ground with the prop revving, the prop-blast can be felt. Now when the plane is in the air the prop blast is still there although not so strong. If the airspeed is V, the prop blast $= V + v$, where $v=$ slipstream velocity. Also, the speed through the prop disc, which we need for pitch layout $= V + v/2$, or the airspeed plus the inflow. (I am enclosing a nomograph to give the airflow for rubber models.)

Now, if we divide the airspeed by the airspeed plus inflow we get the "Ideal Efficiency" $= V \,/\, V + v/2$. The drag of the blades, etc.

reduces this to a practical eff. A nomograph for the "Ideal Efficiency" of power props was given in the AEROMODELLER ANNUAL for 1948 by P. R. Payne.



I must congratulate you on the Circular Airflow theory, It really has explained things which I could not understand. I have found a new way of calculating it for a glider which cuts out any "trying" such as you had to do in the '52 book. I want to work out some examples as soon as I am not quite sure yet whether your conclusion that models with rear C.G. are more sensitive to Circular Airflow is generally true or not. Your examples certainly show this but is it all the theory? Which is most important factor? The position of the C.G.; the Static Margin. or the Tail Volume: Looking at it one way it seems the 35% C.G. ought to be most sensitive.

Here is my formula for Circular Airflow which allows for the correct angle of bank, increased speed—the lot! U in the equation is the straight line speed in ft./sec., you can use the graph on p. 95 of the '53 Book if you like.

Sin of Increase in Tailplane Angle = $\sin A\alpha_t = \frac{\ell}{g} \cdot \frac{u^2}{r^2}$

Or in more practical form: Angle in Degrees = $\frac{3}{20} \ell \frac{u^2}{r^2}$

Now we know that $u^2 = \frac{2}{\rho} \times \frac{\text{wing loading}}{\text{lift coefficient}}$

So increase in Tailplane Angle = $\frac{3}{10\rho} \times \frac{\text{wing loading}}{\text{lift coefficient}} \times \frac{\ell}{r^2}$

use same units throughout where ℓ is inches, u and r in ft.

Looking at this we can see why power models and chuck gliders are affected by Circular Airflow so much.

The practical form can be used for calculating extra decalage angle when designing a glider. It cannot be used for analysing flight of a plane, for as you have explained, as the plane turns the trim is altered thus altering 'u' in the equation.

BLANCHARD WING by B. Poythress Kingston, N. Y.

Woody Blanchard introduced what to me is a new approach in wing construction which might possibly lend itself to kit use. This is the construction he is now using on his Cargo Clipper. Span is over six feet with 10% airfoil section. Rigidity is about as good as a solid balsa wing, both in bending and torsion. The construction is the simplest I have yet seen and it maintains aerodyamic smoothess on the upper surface extremely well with very low weight. I have tried it on a smaller scale and I am sold.

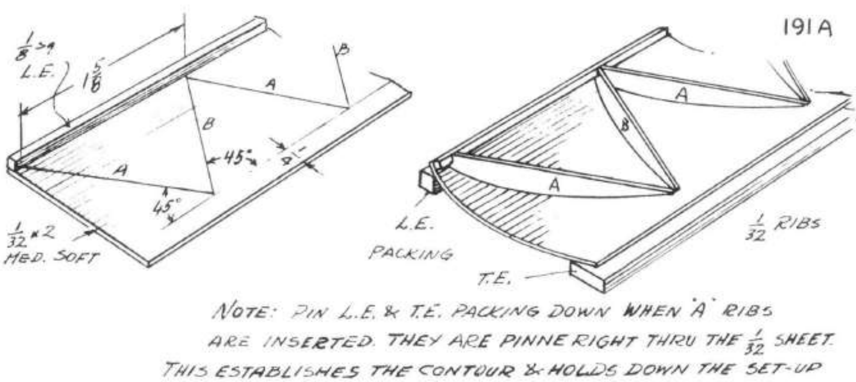
These sketches are the construction used for small ships. On larger models the wood sizes go up and a trailing edge piece is added. The ribs, of course, have to be plotted to allow for the angular location (like geodetic construction.)

The lines shown as A and B are the rib positions. The 1/32 x 2 is the upper surface. The wing is built upside down by first gluing a leading edge strip and locating rib positions. Then L.E. and T.E. are blocked up with strips for full span. Pin these trips to the board.

All of the "A" ribs are put in first. Pin them right through 1/32 sheet. This establishes the counter and also holds down the whole works.

Then the "B" ribs are trimmed if necessary and put in.

After the ribs are cemented in place, the wing is turned over and sanded just as a hand launched glider wing. The dihedral is put in the same way. Use a 1/4 rib in the center. Cover top and bottom with jap tissue.



FROM O'DONNELLS

England

Very many thanks for your last letter and the rather nice way of telling us to hurry up with some 3-views! Please accept our apologies for the delay—we found the usual modeller's difficulty in drawing what he has built! However, hope that the enclosed set of drawings will be of use, and that you can fit them in O.K.

All are good dependable contest models, and a long list of contest times and places could be quoted. However, such information would mean little to a modeller unacquainted with British contest rulès and conditions, and has therefore been omitted.

The Wakefield we flew last year in Sweden were very similar to "MAXIE 29" that you had in the 1955-56 book. We have not produced anything better than the basic "MAXIE" either for Wakefield or unrestricted events.

DESCRIPTION OF MODELS
By JOHN O'DONNELL

"CASTAWAY"

Latest in quite a long line of JETEX powered models of assorted sizes, shapes and weight, produced by Hugh and I over the last few years. Obtaining ratios of five or six was quite easy, but any more was a different tale. Due to the limited power and heavy weight of the JETEX unit, a reasonable power/weight ratio of the complete model necessitated ultra light model structure. Eventually the high thrust line layout was adopted and thus enabled looping to be controlled without resorting to knife edge trimming methods. The "CASTAWAY" has a 76.5% C.G. which gives reasonable stall behaviour, and the very high location of the JETEX discourages loops. Flight pattern should be a very steep spiral with rudder to provide turns and wing warps to give roll. Duration of about 1:30 to 1:40 off a single charge (7.5 sec. effective) can be obtained in evening conditions without apparent lift.

"MAXIE 38"

This is currently the latest "MAXIE", and is a lightweight structure model for our unrestricted events. To all intents and purposes it is virtually a 1953 Wakefield minus U/C, and plus various refinements. Weights quoted are after much flying, and 3.0 oz. structure is achieveable for a completed new model (as distinct from one compromising a new fuselage for old components such as "MAXIE 38"). Featherers are preferred to folder for "unrestricted rubber" as they are less sensitive on glides to slight knots in the motor, can be built lighter, and in the event of rough landing the prop usually breaks before the fuselage nose (quicker to field repair).

Performance is adequate for still air contest, and the model is stable enough for bad weather. Model should fly on same trim from 50% turns onward. Ultimate performance depends on quality of rubber available.

"PENDLETON FAULT"

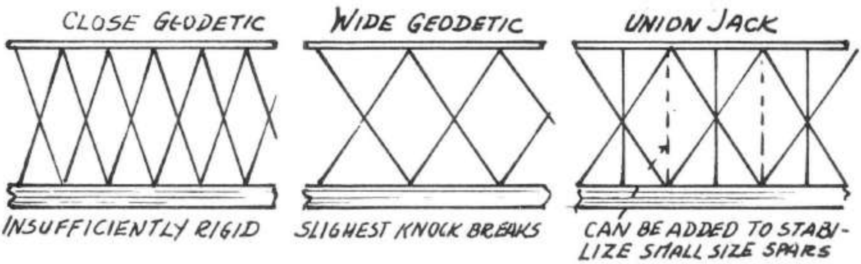
This complies with the 1956 F.A.I. Power Rules when equipped with VTO props on fin, underfin and tail tips. Power is supplied by Eifflander 2.49 cc diesel—these are hand made in limited numbers and several versions have been seen. The example is disc valve, twin ball race and weight 4.6 ozs.

The model manages to combine a 95% C.G. with about 2½ degree incidence difference, and does not suffer from long dives on the glide. Flight pattern is a tight vertical right-hand spiral with nose right up, followed by a right-hand glide. Power climb tightens and levels out with reduction in prop-pitch. The model/motor combination does not like fine pitch wooden props and is currently (May 57) being flown on a nominal 9 x 6 Frog Nylon prop.

GENERAL

WARPS: I feel that warps should be regarded as a trimming device, and not as an unpredictable and unfortunate result of doping.

UNION JACK CONSTRUCTION: When geodetic construction first appeared it had two big advantages i.e. increased resistance to warpage on doping, and to wing flexing when covering slacken thro' damp. However, to obtain this rigidity, it was necessary to "open out" the geodetic crosses, which left long unsupported lengths of L.E. and T.E. These were quickly distorted by doping and were very prone to "knocking-in". The answer appears to be a combination of both straigth and geodetic ribs—only snags being construction and the requirement of accurate rib plotting.



THE PROXY FLIER

SILVIO LANFRANCHI England

So you think that I am qualified to give your readers some hints on how to win even by flying proxy?

Well Frank above all we must respect the intelligence of the aero-modellers who are most likely to purchase your very fine book. I realize that the majority of them are both practical and technical men therefore it will be impossible to bamboozle them into believing anything that we don't believe ourselves.

We must begin with luck; without it I do not believe I could have won at all. But we all have the same amount of space to fly in and with the rules as they rightly are, the luck seems to be as evenly shared as is possible. Naturally a wise Team Manager will see to it that the man whom he thinks has the best chance of winning should also be given the best conditions. In England in '56 when I tied for first place with Connovers Lucky Lindy I was given such consideration. With each period of one hour each team had to put one flight in, when we had rain in one of the periods the Manager put me on at a later round when conditions had improved. (Incidentally, in that rainy round as many maximums were put up as in any other).

In Switzerland in '52 when I flew Wheeleys Ship the position was reversed and there luck probably played a major part. In Zurich I was Team Manager, and as such it was my job to see that the British Team put up a good show. They mattered more to me than my own flying, so I paid concentrated but only secondary attention to my model. Now that I have disposed of the luck element I will tell the less experienced the need for the utmost attention to detail.

As soon as I received Connover's Ship I read his instructions relating to the flying of the model very carefully, and when many of the other competitors were ready to call it a day I was still test flying ironing out as many minor snags as was possible. Timer trouble is the most prevalent disease that attacks the competition flyer at the crucial moment in the contest, so I concentrated on getting the timer correct and as near to 15 seconds as possible. My amount of testing was proved good when my engine times for the five rounds varied only between 14.5 and 14.9. One thing must be understood; without a first class timer all efforts are useless. Engine testing on the ground is not always sufficient. I remember flying once in Davos, Switzerland in winter. On the ground the timer behaved perfectly yet it was far from right when in the air. So above all; be sure of your timer.

Second only in importance to the timer is your cut out. I find the tube constricting type the best. With a valve cutout I have experienced complete failure and partial failure to function. With tube constriction even in an emergency one can pass the feed tube through two staples and with even a piece of cotton attached from it to the timer will do the job with accuracy and certainty.

Above you have, in my opinion, the three main points which will help you to victory. (1) LUCK; (2) ACCURATE TIMER; (3) POSITIVE CUTOUT. Now what more can I say, or what further advice can I give?

Quite often you find good models endowed with an inadequate undercarriage. Such was the case with Wheelers Ship. To my mind a curved piece of wire attached to the underneath of the fuselage does not give the model the chance it deserves. To prevent the pile ins on take off that so often occur I recommend the use of a wheel on all ships.

Now a word about dethermalizing. It is important to be able to attach and light a completely reliabe dethermalizer fuse so as to bring the plane down after 3 minutes. In this matter my club mates have been a great help. We all use the same type of fuse and by trial and error we have now arrived at the correct length of fuse to use. These are cut up in the appropriate 3 minute size in ample abundance before the days fling begins. This stops all worry on this score as long as you remember to light the thing. In very wet weather I do use a small shield to protect my fuse from the elements.

One item I have omitted from my notes. First and foremost one has to be in possesion of a proxy ship that will fly. . . . and then having taken care of all the details outlined above, be very, very careful at the actual time of take off. Here experience and a cool approach is necessary and of course organization. I am supposedly unable to put up a good show unless I have my trusted friend Arthur Collinson with me. This is substantially true, but I have sometimes to discipline myself to be helped by others. In the case of Connovers Ship I required the assistance of two helpers. Firstly the timekeper who would give me the OK when a three point contact was made, then the Team Manager would tap me on the shoulder, then and only then would I release. Any mistakes incurred at this point would certainly mean defeat, by disqualification. I mentioned a cool approach; I find that the only sure method of achieving this is by continually flying, by doing this one acquires a certain amount of coolness and steadiness that stands one in good stead when the crucial moment arrives.

If you are therefore ever confronted with the task of representing another nation in our sport, get around you some useful helpers, the one, for instance, who will remind you gently but surely that your timer wants releasing just before, not after you have let go. Get your friends to tell you just how or if the machine misbehaved on any of its flights, no good telling you that you failed to put up a max. because he knew the glide was poor, AFTER the event. I believe that it was just such an event that made me fail by a mere 13 seconds to beat Wheeley in Long Island in '54 because what happened to be a loop was in fact regarded by me as a steep corkscrew climb. It was in fact a loop, and in the next flight this developed much sooner and I recorded 167 instead of the desired 180.

Have I, in the lines written above, satisfied you the reader? Have I given you any useful hints? I have not given you any magical formulae on how to win, that is an impossibility, but I have tried to tell you that you cannot win with bad luck, and that you don't stand the slightest chance of achieving anything of note without the utmost attention to detail. I have been given two chances to fly proxy in the World Championships and on both occasions I have gained a first, I have proved that I can also fly my own ships because I believe the recipe to be much the same.

I have therefore proved it can be done, that a proxy flown model stands as good a chance as anyone's to win the world championship. So let us hear no more talk of holding the championships only bi-annually, surely the national organizations of every country can afford the price of a parcel to which ever country is holding the Championships.

INSTRUCTIONS FOR PROXY FLIER

by William Hartill ———————————— Passaic, N. J.

I am in the midst of deciding what to build for 57 and 58. It is almost too late to get started on ships for the 57 season but the new FAI rules (Only Nordic and Speed in 57) wil make things a bit less hectic.

I have in mind a Nordic with a superlight tail-condenser paper covering on stab and rudder, light tissue covered rear fuselage, and a wing with an ultra thin section but with same undercamber as Gott. 342.

One big consideration here is that chances are the 57 Nordics will be proxy flown. What does this mean to the design? Perhaps a ship should be designed so that a proxy flier will be at best advantage.

First of all, the proxy flier generally gets very little time to test fly the ship. Only a few flights that will just serve to introduce him to how everything works. Model boxes are forever getting lost, arriving too late etc., and the logistics involved of getting your model to the hands of the proxy is a real problem.

The parts of the model design that deserve the most attention are the tow hooks, auto rudder and dethermalizer arrangement. The most popular auto rudder arrangement is the type that uses a ring attached to the rudder pull string that slips over the tow hook. Adjustable tow hooks are sometimes a help if the flier feels a C.G. change is needed or the ship is not towing right. At any rate, the auto rudder should be easy to hook up everytime without thinking too much about it. Nothing will wreck a flight faster than an auto rudder that pops prematurely or not at all. Check to see that there is no interference between the fuse fixings and the auto rudder, no matter how the fuse is put in.

Make a sketch showing how all the gadgets are hooked up and how they work. The auto rudder hook-up should be designed so that the direction of turn can be switched easily in case a warp pops up in the wings that forces a turn.

If both ships (1st and reserve) are identical, be careful to number wings, tails etc., so that they do not get put together wrong. Sounds silly but it can be done.

Your instructions should include background information about the features of the design, type of flight, symptoms of stalling etc., but be very careful how you write these instructions. Do not insist that the proxy fly the ship a certain way, just the desirable way it usually flies, and let the proxy fly it the way he sees it. There is always the chance of a slight warp creeping in by the time the proxy gets it so this is up to the proxy to find, and either de-warp or re-adjust. There is also a good possibility that the proxy will do a better job of flying than you could do. He will have the advantage of being on his own home ground but will also be suffering from an immense feeling of responsibility to show what he can do for you. So send him a brochure, not a cook book, and try to cheer him up. Do not go overboard in apologizing for your super-duper crudbarge, however, he might agree with you. Just concentrate on explaining the tricky parts and the general flying characteristics.

Aside from the outcome of the contest, one of the most rewarding thing about this proxy flying business is the real friendships that are struck with people in a different land through that all powerful catalyst, the free flight model.

There is still a lot of luck involved in winning; the number of downdrafts, updrafts, etc., nobody can do anything about; you, the proxy or anyone else. The proxy fliers are not super men nor are they driveling idiots. The best assumption to make is that they are at least as good as you are. Once in this frame of mind the ordeal of waiting for the news maybe alleviated somewhat. If not, try aspirin.

DESIGNING U-CONTROL MODELS

by Bill Netzeband —————————— Kirkwood, Mo.

As far as your question of "Can a control-line model be designed" goes, I think it can. With reservations, of course. Using your formulae from the 1951-52 Yearbook and the data presented in M.A.N. I have designed and built 2 ships and had them fly as predicted. There are naturally problems such as getting the CG built into the predicted spot which require experience and rule of thumb techniques, but I am confident enough in the information we have available. Further back-up was provided when I checked out existing ships mathematically and had results hit very close to observed performance. Biggest detriment to preliminary design is the use of stabilizer-elevators rather than stabilators. Moment arm and area are next to impossible to predict so we revert to formula. Drag is another unpredictable parameter, but doesn't give too much trouble, since most ships (stunt) seem to be about the same. Therefore, combining mathematics and experience we can confidently draw up an airplane, predict performance, and build it to specs. It will then proceed to perform as predicted with probable minor changes of balance.

The flying wing is another matter and I hasten to add that I don't understand all I know about them. The constant chord wing-on-a-string amazes me that it performs at all, although they fall into line by leaving something to be desired when stalled. If kept light and fast and never stalled out they are fair although I cannot cause one to turn the way I'd like, that is, if I want a slight change of elevation it might or it might not. We've also had them dive into the deck from 20 feet for no real good reason except hunting.

The Half Fast shape or semi-delta makes a bit more sense in that 16% tips are used with a 12% root, taper being linear from root to tip. Sweep back of quarter chord is 15.75 degrees and I determined the M.A.C. by geometry and fudge factors. Luckily balance came out right where I wanted it and where I wanted it was where the airplane wanted it too. I deliberately moved it around; aft made it unflyable, while nose heavy trim made it docile, in fact sluggish. Increase of elevator area and motion with nose heavy trim helped some, but never came up to optimum trim performancewise. Reason was extra drag I suppose, plus added weight necessary to get nose heavy. I have 2 of them now that fly perfectly level at neutral, but respond instantly and in a predictable manner when control is applied. Won a third in stunt last year just clowning with one of them.

One thing I've noticed about size. The ½A has to balance more nose heavy than the combat, and the big stunt version balances farther aft. Or the larger we get the farther back our optimus CG gets. Reynolds Number, turbulent flow? You name it. By sweeping Center of pressure we get the conventional layout of tip as stab. The thick tip acts as washout and gives a stable stall. I don't think you want a detailed analysis of wings so will fire this off now.

BEGINNER AND HIS FRIENDS

"Today is ours—
Tomorrow is his!"

MODEL BUILDING IN OUR FAMILY

by Bob Hawkins —————————————— Morton, Ill.

Your letter of November 14th asked if I had some words of advice or suggestions to make for those persons who are interested in helping young model builders become more proficient. Of course, the main experience I have had with such a project has been with my two sons, Brent, age 12 the present Junior National Champion, and Brian, age 8.

The hobby of model building goes back a long ways in our family. I began building rubber powered models in 1929 and in 1935 when I finally acquired a Brown Jr. gasoline motor, my father became interested, too. Together we became quite avid free-flight gas model flyers and by the late thirties and early forties it was not unusual for one of us to place first and the other to place second in contests in our area of northern Indiana. I flew in National competition in 1936, 1937, 1938, 1939, 1940 and 1941.

During my period of military service from 1943 to 1946 my dad carried on the family interest in model building by serving as an instructor (during the evening) in a park department sponsored craft class in model airplanes.

The above serves to show that model building in the Hawkins family has not been a passing fancy. It's a lifetime hobby with me and for my dad who is now sixty-one and still an active builder, if not flyer. Probably the greatest single asset my sons have in creating their interest in model airplane building is the fact that their father and grandfather are so keenly interested in the same hobby. Next in importance is a very complete library of model magazines and yearbooks. We have an almost complete set of Model Airplane News since 1929! Air Trails magazines of the late 1930's and early 1940's also contain many articles and full size plans for use by beginning modelers. Of course, we also have nearly all the "Yearbooks" published by you.

With the above information as reference material, we have found it easy to choose plans for planes which are increasingly more difficult as the skills of the boys progress. Perhaps one of the most important things in teaching youngsters to build model airplanes is a wife who will agree to let you give a four year old boy a singe edge razor blade and let him start cutting. That is actually the age at which each boy began working (?) on model planes. The first efforts were sometimes hard to distinguish as airplanes and sometimes blood-spattered, but each plane got a little better. Choice of plans is very important at this time. Actually, sometimes I made cardboard patterns to trace on sheet balsa and cut out, because at 4 and 5 years of age these youngsters could neither use a ruler nor read. I found from their experience that it's awfully hard to build an airplane when you can't read the plans!

Therefore the teaching method had to be changed and the cardboard patterns came into being.

Brent got an Atwood .049 engine for his seventh birthday. After that progress became faster and interest in joining a club and participating in contests with others came fast. All along the line in working with the two boys, I have found the importance of helping them choose designs which are simple enough for them to construct—and yet which will fly to some degree. Contest activity progressed from local to regional to the Nationals at Chicago in 1954. The main thing gained from the 1954 Nationals was the chance to see contest models and modelers in action. The following eleven months saw great preparation by Brent for the 1955 Nationals in California. There, through the help of Woody Blanchard at the evening test flight session, adjustments were corrected on several ships and Brent was able to win a few trophies. Again the major thing gained from the Nationals was the number of new ideas and designs which we saw in evidence.

Preparations for the 1956 Nationals at Dallas began in September 1955, when Brent began building new Wakefield ships using fuselage construction ideas shown him by Woody Blanchard. I might add here that if Brent has an "ideal" among model builders, it's Woody Blanchard. The few minutes taken by a busy, experienced modeler to show some youngster how to make his planes fly better is often times all that is needed to develop a future aeronautical engineer. We could probably all profit by Woody's example.

Both Brent and eight year old Brian have had the bitter experience of having me tell them that a completed fuselage, wing or tail was "not good enough." They had to be encouraged to start over and do the job right and it was sometimes hard for them to do. I believe that the "example" method is also a good way of showing youngsters how to build models. Sometimes a 1938 plan doesn't look so good to a 1957 youngster, but when dad builds one of the planes and it flies fine, then the boys are more ready to give it a whirl themselves. Until recently I have been able to set the pace with higher times or better workmanship than their planes. In September in Chicago I came out a fourth in hand launched glider to Brent's second! Age is beginning to tell on me I guess—or did he hit a really hot thermal? Anyway, family competition is becoming keener and Brian has expressed a desire to "beat Brent in some event at the Nationals before he becomes a Senior in 1960." You see, our vacations are planned for years ahead to include the week at the Nationals wherever they may be.

In summary, I believe young model builders need parental interest and encouragement to become really proficient contest modelers. Their planes must be given a chance to compete against the planes of others if young modelers are to see the need for improvement in design or workmanship. And let's not forget for a minute that really scientific, competitive modeling can become expensive, so again parental interest is needed to supply the funds for those "special" items that make the difference. I am personally quite content not to know how much we have spent on model supplies in the last few years. Whatever it was, it was worth it. My boys and I enjoy each others company in our workshop and we are very proud of each other whenever any of us gets into the winner's circle.

THIS YOUNGER GENERATION

by Bill Lane
Los Angeles, Calif.

Your thoughts on a series of kits for beginners. was interesting. However, I believe that you are in that same rut that most of us tend to get into. It wa my own recent realization that the younger generation do not approach the hobby from the same tack that we did when we were the younger generation.

The era of jets and rockets and very cheap power for models has changed the perspective of these youngsters. As an example let me tell you of a recent experience. My son saw his first R.O.G. not too long ago! He was amazed that something so small and delicate could fly. I asked him if he would like to build one and he said "Who me? I can't work with that small stuff, it's too hard."

The whole point is, he has never had the incentive to start one of those things because he went straight from plastics to gas models. I am sure he would build one if the other kids in the neighborhood would go along with him, but they are still on the plastics, and I know that when they finally get over this phase they will want to build gas models jus as my son does.

In short, I believe that if you were to go into such things as R.O.G. kits you would be letting yourself in for a lot of disappointment. Another thing—when you see kids out at the model field nowadays flying gliders the odds are ten to one that the glider is a copy of the contest type of outdoor handlauncher. I know that Jim Walker sold millions of his profile jobs, but I honestly do not believe that there is any one who is capable of producing the same sort of glider for the same price and still make a profit. If you have never seen his manufacturing set-up for the gliders you should hop up to Portland some day and have a look. When you boil down all the comments you will see that I am trying to say that I do not believe that the glider is the correct approach. (Of course I can be wrong, I went broke in the model business twice.)

I am still of the opinion that the A-. is the real answer to getting these youngsters started in the model business. Since the AMA has decided to include it in the list of categories, now it should just be a matter of time until A-1 and A-2 are recognized glider types in this country. In light of all this it would appear that the A-1 is the obvious choice for a kit, perhaps even before considering anything else. This is interesting telling someone else how to go broke in three easy lessons!

COMPETITION HINTS FOR JUNIORS

by Dick Mathis ——————————— Dallas, Tex.

Here is a late answer to your letter asking for competition tips to Junior Flyers.

I have just one "secret" to offer to trophy hungry juniors, and since after fifteen years I'm sixteen and a senior, here it is.

—"FLY GLIDERS"—

That's really all that is necessary. However, if anyone is doubtful, I have reasons. The Junior event is rapidly becoming a Father and Son event at the larger contests. That is a fine thing for the hobby, and should be encouraged, since it means we have two modelers active instead of one, or more likely, none. However, it does make competition a mite rough on the "Do it yourself" Junior. Dad can guide the little hand while each joint is glued. He can trim the model, start the engine, hand it to his boy, point him into the wind and shout, "turn it loose." He has followed every rule in the book and can rightfully squelch any contest director that is fool enough to take issue.

However, our rules makers are wise and tricky. They anticipated this situation, and to protect the orphan junior, they inserted the equivalent of these magic words: "Father can't throw it or tow it"

As for the other events, fly them if you have the planes. You are sure to pick up an occasional prize on the way. The experience gained from your gliders will make you a threat in any class.

This advice is tested and sure-fire. It positively will help you win contests. Let me outline step by step how to win a trophy at the Nationals, or any other big contest that has a junior division and all free flight events.

First, start your preparation far in advance. Get a good book on model aerodynamics and read it from cover to cover. Memorize the section on flight adjustments. I found Don Foote's "Aerodynamics for Model Airplanes" in the school library and kept it checked out continuously for about six months. Read everything you can lay your hands on about free flight adjustments. There are a handful of genuine experts in the country who contribute to the magazine regularly. They all preach the gospel as follows: "No warps and small step by step adjustment. There's nothing complicated in that, but just stray one time from the straight and narrow path they prescribe and you've had it.

Now you are ready to build. Don't build first and learn to fly later. Not your contest ships, anyway. That is the way your competition is doing and you want to beat them! Don't build a copy of a famous International winner. Build a good kit. I held the Junior Nordic record in 1955 and won the 1956 National Nordic event and many more with a Jasco Nordic kit, built strictly according to the plans, with no alterations. Since no up-to-date kits are available at this time in Indoor H.L., A-1 Nordic or Outdoor H.L. Pick the simplest ones you can find in the year books or magazine plans. I plan to compete next year with Larry Conover's "Flanger" for hand launch. It has the ability to ride out a lot of turbulence without spinning in.

Now that you have the knowledge and the planes, the rest is just a matter of practice. Your secret weapons must be the ability to tow and throw. Very few juniors can do either, and the ones that can are the ones that bring home the trophys. Very little has been written on the subject and all I can say about it is get out and do it.

Spend six months tossing and towing every time you get a chance and then dust off the mantle and head for the Nationals. You won't come back empty handed.

Here is how it worked for me in the 56 Nationals.

First in Nordic
First in Indoor Hand Launch
Second in Limited Towline
Third in Indoor Stock
Second in Class A F.F.

One last word, stay away from "gimmicks" on your planes. Build them conventional and simple, and THINK! THINK! THINK! before you fly.

TEACHING MODELS IN SCHOOLS

by Barry V. Haisman — Montreal, Canada

The year books were extremely popular prizes at the Eastern Canada Open. It was my suggestion they be awarded, chiefly because I believe the modern modeller doesn't know about their value, and because he needs educating anyway. Excuse me, but I teach high school.

Personally, I have given up with juniors, beginners etc. I have been modelling twenty years and at different times have run modelling classes as an extra-curricular school activity, promoted and directed beginners' contests, loaned out books (but never your year book!) and magazines, and kept my door open to anybody who wanted to find out the hobby or to watch me building my latest model. I have tried.

The classes were based on a four-model programme, after which the boy was more or less turned loose with a list of recommended kits and model dealers. One dealer cooperated to the extent of giving a 20% discount to any of my "graduates" who came along to him.

The first model was a 12 inch balsa glider for straight flying up and down the gym, designed to teach rudimentary trimming and to give the "feel" of launching and handing a model airplane.

The second was a tougher 18 inch version of the first model, again, for straight flying only (many people fail to realize that the modern hand-launch contest glider is a very advanced model) but which could be flown outside in light breezes. There was a grassy slope near the school, and when the breeze was right we had a lot of fun slope-soaring, with the occasional flight of a minute or more.

The third ship was a rubber driven indoor hand-launch, with dead simple built-up flying surfaces, tissue covered, with 8 inch saw-cut props supplied by the model dealer already mentioned. This involved covering and wire-bending, two high hurdles for beginners. The percentage of failures with this model was inevitably higher, but some good flying was done.

At this point you can tell which ones are potential modellers, just how, I hesitate to say, except that it is something to do with how the boy handles the model and how he keeps trying to improve performance. Building skill is not too important, not as important as dogged persistence and guts, which attributes are, alas, unteachable.

The last model of the series was a 30 inch span glider with sheet fuselage, sheet tail surfaces, and built-up, square-cut, flat-bottomed wing. It had straight dihedral, polyhedral being a complication. While this ship could be towed, catapault launching was more popular, as a boy could fly without assistance. This launching method is much-neglected. We used a 75 foot line containing about 20 feet of 1/16 in. sq. rubber (at the model end of the line) which, when stretched to between one and a half to twice its length, depending on wind velocity, took the model up beautifully—slight inaccuracies in line-up didn't appear to matter—and released it overhead. Often, the model would "hunt" for several seconds at the top of the line before releasing itself, a maneuver that always delighted the builder.

The school principal donated cash prizes for each of these four models, contests being based on the best flight of six in each case.

If such a programme is to be successful, nothing must be taken for granted, from the first time they grasp a razor blade between their uneducated fingers. However, success is real when, and only when, the boys take it from there, join clubs and attempt they own models. And this is where the catch comes—they don't. Out of my group of 18 boys, 2 built other models and now, four years later, I hear that only one is still with the hobby, and even he appears to do little more than hang around the members of the club he joined.

I believe the programme I adopted was adequate, and standard, proven teaching principles were applied, based on the gradual "withdrawal" of the teacher and culminating in student independence—in other words, the last model should be tackled with confidence and a fair degree of independence from outside help, otherwise you must conclude that the first part of the course was unsuccessful.

Many people feel they are doing great educational work with such programmes. Newspapers step in sometimes and wrap the whole thing up in ballyhoo. I was in on such a deal in England with Ron Warring and Hugh O'Donnell, two effective modellers in their own right, as you may know. Catapault-type gliders, all balsa, were employed, backed by cash and publicity and facilities from an important newspaper. The newspaper got its publicity and the model movement got nothing, though while it was in progress you were given the impression the whole country had gone model-mad. It just wasn't so. I believe that a similar stunt is carried on in Cleveland and while I do not know the full details of it I suggest it can prove only one thing—that young people will do anything if you dangle juicy carrots in front of their noses. That ten thousand kids build ten thousand balsa gliders means only that somebody is selling a lot of balsa wood. Kids love to have their pictures taken, flags and banners excite them, and they like to be members of big groups. Take away the trimmings and they go back to fishing and softball.

I believe that if model building is a worthwhile activity it must stand on its own unadorned merits. It must attract, of itself. Brass bands, parades, self-seeking promotional deals and fancy prizes have no part of it. Anything that is worthwhile needs no gimmicks to sell it, and if you sell something to somebody who doesn't really want it, you make an enemy for life. Let's face it—those beauty queens, jet fly-pasts and what all are just a big yawn to the contest modeller; he accepts them only because he knows they are in with the package deal from the sponsor. No Miss Glow Plug, 1957—no contest, and no airfield to fly on. While these frills may do no actual harm let us not delude ourselves into thinking we are doing the model movement any lasting good. We are not.

Ballyhoo is no doubt responsible for occasional surges in the direction of the model shops. At a guess, I'd say that many dealers make their livings out of 75% of kits sold which are never completed. Much of the merchandise sold is unlikely to inspire the customer with any original creative urges. Trade statistics have scant bearing on the general health of the modelling body, for the only modellers worth having are those who stay with the movement.

The overwhelming majority of juniors and beginners are one-year wonders, spoiled dabblers who, once they find modelling requires effort for proper fulfillment (as in any other sphere of activity), fade away in search of something easier. Personally, I am through with them. I refuse to waste any more time in that direction. It has taken me many years and the expenditure of a good deal of effort to come to this conclusion. The recruiting "problem" bores me to tears. I'll be darned if I'll vote for special awards for novices. Why elevate mediocrity to a meaningless status? Let it be accepted that some genuine talent is required for success at contests.

All the effort directed at our pampered, over-elevated adolescents should be applied to the organized model movement itself. Let us set our own house in order—and raise the value of the property. Make it so that outsiders will want, of their own volition, to come into it, and stay there. It is utterly useless to force, wheedle and cajole people into the movement. You can get them that way—but next year they are gone, so why waste the effort?

I believe that a healthy state of modelling depends most upon the management and the leadership of local clubs. Go to any thriving centre of model airplane building and you will find a group with a sound basis of business-like administration; mature, friendly leaders who are unselfish enough to quit flying now and then to make newcomers welcome and tell them what the score is; use of the best flying facilities available; good realtions with local dealers, welfare groups and business organizations; no over-emphasizing of contest successes; literate and energetic publicity. If a beginner feels that such a group is not worth joining he would be doing the group harm by joining it, for it would consist of members who gladly pay their dues at the start of a new year and who cherish feelings of pride and loyalty towards their organization.

Given the above situation, I do not feel that we run any risk of losing potential modellers. They will find us.

All this arises out of your interest, Frank, in developing a complete line of kits for beginners, and it does not bear directly on your problem. But if you do develop the idea successfully I believe you will be doing something which does not yet appear to have been done to the complete satisfaction of dealer and customer.

Put the right line of kits on the market and they will stay on the market indefinitely. Such a line would be a steady seller and not a big seller. It should receive the preliminary approval of several successful model groups. It should not necessarily be in the 89c. category as you cannot produce anything worthwhile cheaply.

The models should require a few hours of actual construction, several hours for the advanced ones. The design requirements should be, primarily, stability allied to a tolerance in adjustment—foolproof models (if they exist) are for fools. They must fly. Looks are, I believe, relatively unimportant to these considerations—I always suspect colorful decals, Air Force lettering and jet-fighter tailplanes as sales gimmicks having no bearing whatsoever upon flyability.

I am thinking in terms of free-flight, of course, partly because it is much easier for a novice to get airborne with a control-line model—and hence lose interest sooner because of the lack of challenge—and partly because there's an abundance of C/L kits already on the market.

As for the models themselves I think there are several fallacies in the conception underlying beginners' models, chief of which is that they should be small. In general, as any builder knows, the larger model is easier to construct than the smaller one, and the small model is useless except in dead calm air. It is not a practical flying model.

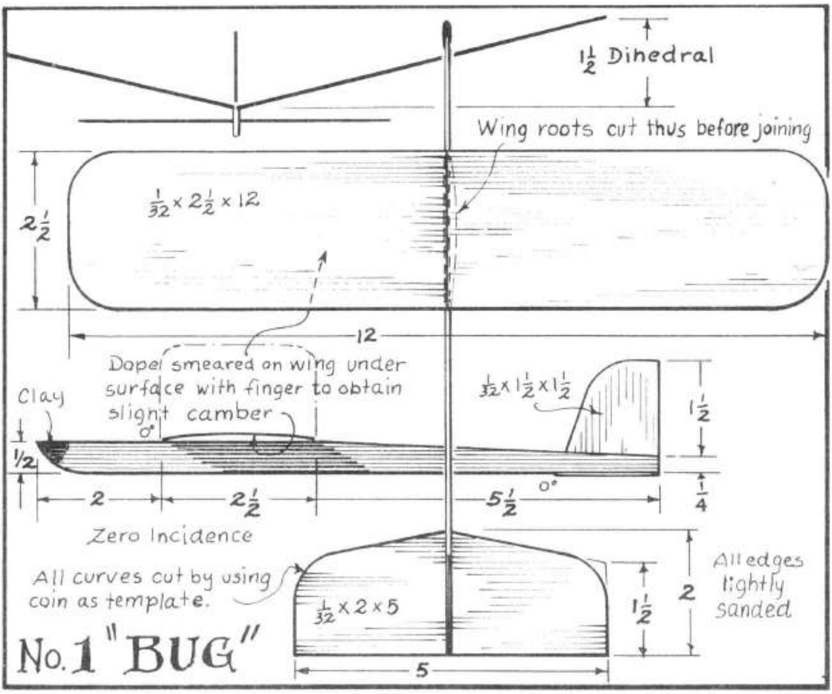
Another wrong notion is that sheet covering is easier to apply and more rugged. I disagree with both of these premises. Make a mistake with tissue and you can pull it off the framework, and unless you know how to use the stuff, sheet covering is a great way of building in permanent warps. Why assume that the beginner will produce a true framework on which to glue the sheet? At least he can dope out warps on tissue-covered flying surfaces. As for it being more rugged, I'll doubt that one too. It splits easily. It is also heavier and harder to finish attractively. And it's more expensive to kit.

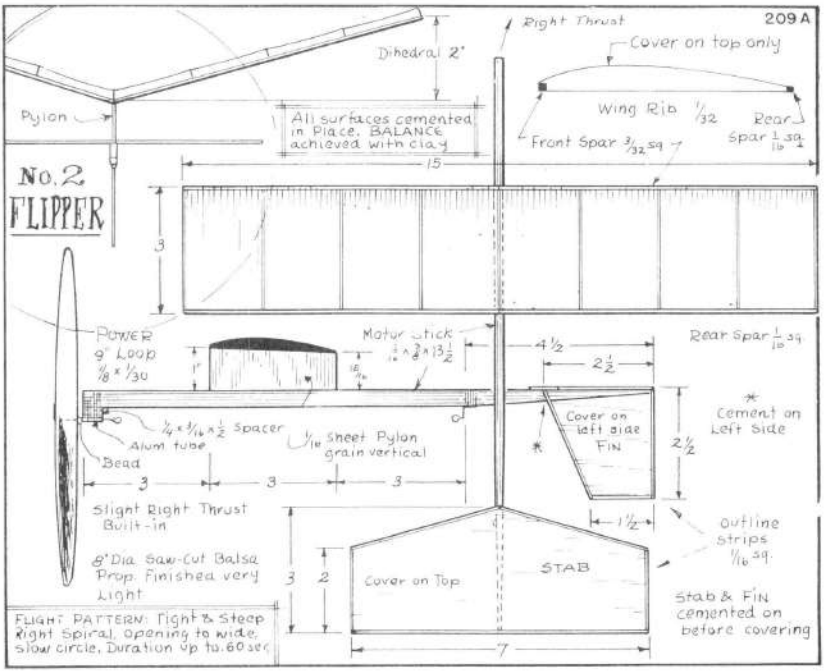
While simplicity is essential I think that many designers of beginners' models over-simplify. As D/T's, timers, auto-rudders, folding or free-wheeling props are standard on contest models they should be introduced as early as possible into any series of beginners' models. He has to live with them eventually, so why not now than later? It will be a brave, but wise man, who is the first to assume a reasonably high standard of intelligence on the part of the novice.

The BUG teaches quite a lot, starting with how balsa reacts to strokes of a modelling knife or razor blade; nothing can be assumed at the outset. It teaches the relationship between CG and CP—I had every boy launch his model at first without any clay on the nose. It shows that a cambered airfoil will generate lift at zero degrees incidence. I let them discover that when turn is applied they recover best glide only after the CG is moved back or the stab warped up slightly. One of the biggest hurdles was getting the knack of releasing the model smoothly at its correct flying speed and nothing but practice and demonstration can solve this. Some of them never got the "feel" of a model at all, while one or two got it after the first try.

We had a lot of fun with this little model. From atop a bench at one end of the gym we'd launch and aim to land in a circle marked at the other end of the gym. As they improve I erected a jumping stand which made a curved flight path necessary to land in the circle. Finally, we launched off a box at the side of the gym to make a complete circle ending on the floor beside the box. One or two of the more ambitious clambered up the wall bars to launch in an attempt to make two or three circles before touching down. I'm not sure that we didn't get more fun out of this little model than the other three.

FLIPPER was quite a hurdle, introducing rib cutting, wire bending and covering (we used a paste for covering which, when damped, allowed easy stripping of a bad covering job). It was too soon to introduce prop carving and I managed to pick up a stock of 8 inch saw-cuts at a low price. They at least involved some cutting, sanding and shaping. FLIPPER is the ugliest of the series, but it was stable, easy to trim and every model flew.


1½ Dihedral
Wing roots cut thus before joining
2½
1/32 × 2½ × 12
12
Dope smeared on wing under surface with finger to obtain slight camber
Clay
0°
1/2
1/32 × 1½ × 1½
1½
0°
1/4
2
2½
5½
Zero Incidence
All curves cut by using coin as template.
1/32 × 2 × 5
1½
2
All edges lightly sanded
No. 1 "BUG"
5


209 A
Right Thrust
Dihedral 2"
Cover on top only
Pylon
All surfaces cemented in Place. BALANCE achieved with clay
Wing Rib 1/32
Front Spar 3/32 sq
Rear Spar 1/16 sq
No. 2 FLIPPER
15
3
POWER 9" Loop 1/8 × 1/30
Motor stick 1/16 × 3/8 × 13½
4½
2½
Rear Spar 1/16 sq
Cement on Left Side
Cover on left side FIN
2½
1/4 × 3/16 × 1/2 Spacer
Alum tube
Bead
1/16 Sheet Pylon grain vertical
3
3
3
Slight Right Thrust Built-in
1½
Outline strips 1/16 sq.
8" Dia Saw-Cut Balsa Prop. Finished very Light
3
2
Cover on Top
STAB
Stab & FIN cemented on before covering
FLIGHT PATTERN: Tight & Steep Right Spiral, opening to wide, slow circle. Duration up to 60 sec
7

Comes the question of the actual design of such a series of models, and I hope I have nowhere implied that I think it is easy. I doubt if one man alone could succeed in doing it. Anyway, Frank, I do have a few ideas, but would first be interested in knowing whether you agree with my reasoning so far. If you do I would be glad to scribble out some suggestions. Why not make a list of basic requirements and poll some of the experienced modellers?

Sunday, 24th February, 1957

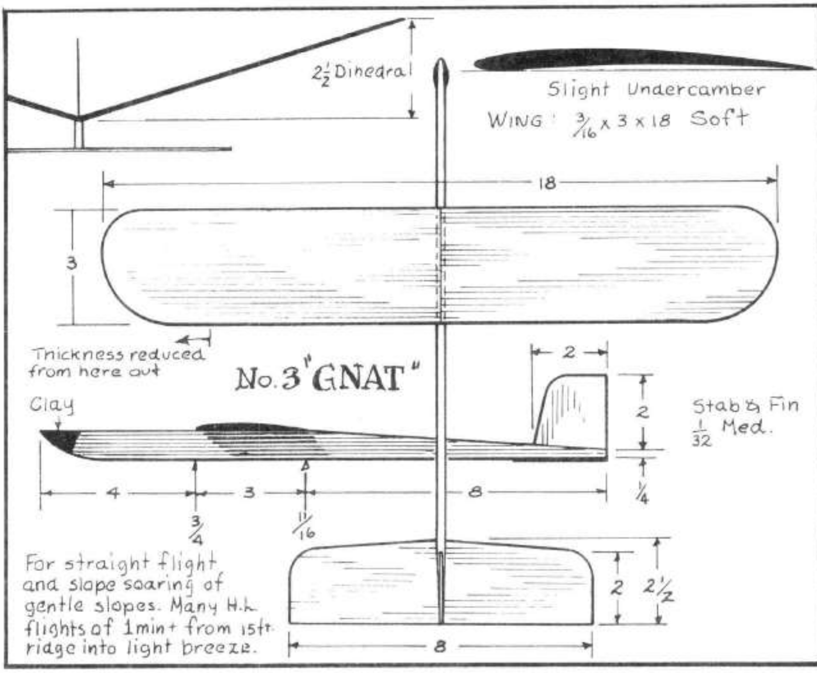
The drawings of the four models mentioned in my last letter were so beat up that I've made the enclosed scale drawings. While it is a few years since I carried through this project I would not change three of the models in any way—I might now throw the rubber job out and replace it with a ½A free flight. One or two suitable ½A's have appeared in the magazines, in fact. Any beginner's series of models today cannot leave out gas. The engines are cheap and reliable.

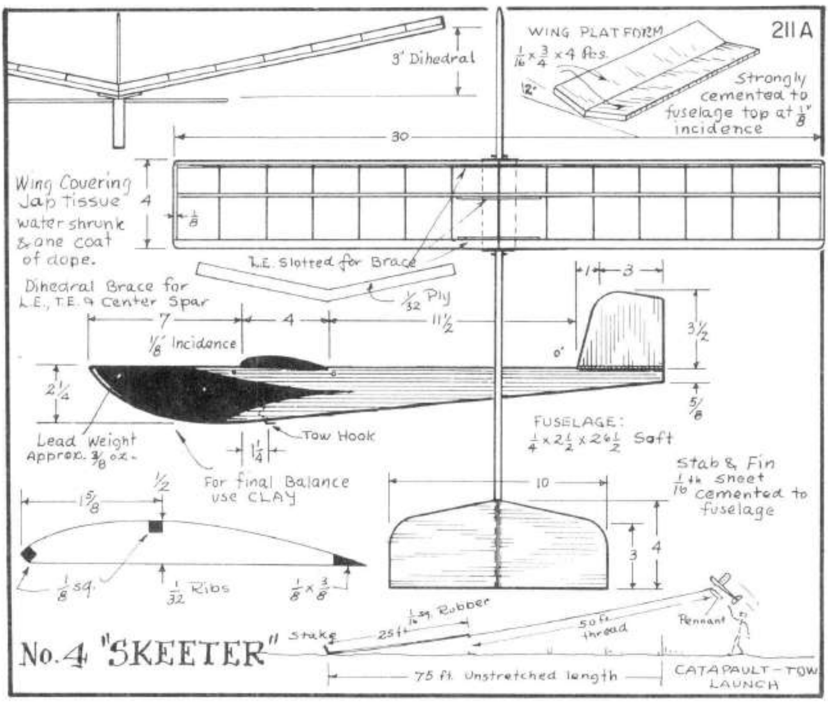
You know a lot more about production than I do (I know nothing about it, to be precise) but can very much be taught by providing many parts that are die-cut and ready-profiled? Of course, to be able to supervise the novice's every move, as I did, is very different from teaching him through a kit with printed words and printed parts. I suppose your idea is to give the boy something that is virtually foolproof and will definitely fly, even though he has picked up a very minimum of building skills on the way, and then, having got a kick out of flying, he will want to proceed further.

On the models I tried, you will see that there are no concessions whatsoever to appearance. They are plain ugly—except in the builder's eyes when he finally has them flying.

The GNAT was pretty easy after all that and I was able to allow most of the boys to do a lot of work alone. Initial trimming was done in the gym. Blessed with a series of near-calm days and a suitable field with slope near the school the boys could not have had a better introduction to outdoor flying. Again and again the models would float upward ten feet or more after release before moving forward over the field.

The SKEETER proved to be a fairly straightforward project, the larger sizes involved resulting in a fewer boobs. Fuselages were given two coats of dope and tissue trim applied to the nose (the only concession to appearance in the whole series!) The design includes certain features found useful on catapault-launch gliders, such as plenty of side area, a slightly larger fin than usual, small stab and a thickish airfoil. All models that were reasonably true went up smoothly on the line to release at about 65 feet above the anchor stake. Much less stretch is needed than you'd expect to get the model whooshing upward, except in flat calm. It has always surprised me that Nordic enthusiasts don't use this launching method for early trimming, for you can operate without a helper, and the cast-off is as smooth as on a good tow launch.


2½ Dihedral
Slight Undercamber
WING: 3/16 x 3 x 18 Soft
18
3
Thickness reduced from here out
No. 3 "GNAT"
Clay
2
Stab & Fin 1/32 Med.
4
3
8
3/4
11/16
1/4
For straight flight and slope soaring of gentle slopes. Many H.L. flights of 1min+ from 15ft. ridge into light breeze.
2
2½
8


211 A
3" Dihedral
WING PLATFORM
1/16 x 3/4 x 4 Pcs.
12°
Strongly cemented to fuselage top at 1/8" incidence
30
Wing Covering Jap Tissue water shrunk & one coat of dope.
4
1/8
L.E. Slotted for Brace
Dihedral Brace for L.E., T.E. & Center Spar
1/32 Ply
1
3
7
4
11½
3½
1/8" Incidence
0°
2¼
5/8
Lead Weight Approx. 3/8 oz.
1¼
Tow Hook
FUSELAGE: 1/4 x 2½ x 26½ Soft
For final Balance use CLAY
Stab & Fin 1/16 th sheet cemented to fuselage
1/2
1 5/8
10
3
4
1/8 sq.
1/32 Ribs
1/8 x 3/8
1/16 sq. Rubber
Stake
25 ft
50 ft. thread
Pennant
No. 4 "SKEETER"
75 ft. Unstretched length
CATAPAULT-TOW LAUNCH

SPORTS vs MODEL FLYING

by Clarence Mather ——————————— Ann Arbor, Mich.

I have also wondered what effect plastic kits would have upon young builders. I have concluded that the fellow who develops into an avid modeler had a great desire to build things himself and would not be satisfied with assembling six or seven pieces, even though the product be beautifully detailed.

I think that someone without the desire or ability to construct but who has an interest in airplanes will "build" the plastics. Thus I do not believe the plastic kits hurt the model building hobby to any extent. There are probably a few who would struggle with a conventional kit if the plastic one was not available but they would not develop into a real modeler anyhow—or so sez I!

Here in Ann Arbor boys have many more activities available than they could possibly partake of. In the winter parks are flooded so they can ice skate when it is cold. There are hills in and about the city for sledding and skiing. City schools have swimming and basketball on Saturdays and during vacation days. Organized ice hockey is conducted on the University's rink so it is held regardless of weather. In the summer there is swimming, boating, water skiing, fishing, etc., on the many lakes around Ann Arbor. There is organized baseball and other activities on the city's park for boys of all ages. Of course, there are the usual passive activities of T.V., Big Ten sports, movies, etc., common to a metropolitan area.

Yet, with all this super market activities to "buy" each year, several young fellows take up modeling which requires hours over the work bench in building and repair. Obviously (??) they must have a need for that particular kind of activity.

I enjoy practically all of the activities listed above and spend some time each year on them. Yet, I still thoroughly enjoy sitting at my work bench drawing and building the two or three models I now get built a year. Then I enjoy fully as much as the flying of these models. I guess that a few people with similar tastes are born each year. Our job is to help publicize this hobby so that everyone is aware of it and the challenge it offers.

The older I get the more I realize what a good hobby we have for young and old. True, a twelve year old can assemble a kit and hook a thermal but there are challenges to everybody. One of our builders has a Ph.D. in aero-engineering and is a prof at the U. of M.—I hope my little boy finds modeling interesting and so learn many useful skills as well as keeping occupied.

MODEL BUILDING FOR NEWCOMERS

COLIN G. CAMPBELL ——— Angus, Scotland

One can learn to build model aeroplanes at any age between eight and eighty. Many have come into the hobby long after "junior age." Late starters may have been interested in aircraft all their lives finding at mature age that aeromodelling is an ideal outlet for their enthusiasm. It is more educative than full-size flying, in some ways, and is much cheaper. It is wonderful to discover that as little as a razor-blade, straight edge and cement is sufficient equipment to convert balsa and paper into miniature aeroplanes capable of true flight. Such beginning leads straight to top class work. The learner must have the will, ingenuity and spare time. He must also be patient.

After an adult trains himself to build the more spectacular types of model he finds his work is interesting prospective youngsters. Junior leaps at a super-scale kit from the nearest sport shop with rosy visions of equalling Senior's efforts between two Saturdays. The inevitable disaster of first attempt often cuts short many a career in the hobby. A few indefatigables approach Senior after first disillusionment. Only a smaller number ever go right on from even the second model. First kit builders require to number two dozen or more before one likely to succeed presents himself. Success is the ability to learn to build good flying models unaided.

A second kind of newcomer is the youngster who is born into a family whose members pursue various model making hobbies. This type does well at aeromodelling and becomes a valuable recruit. They might even appear ready trained and are a blessing to club organisers if they are willing to learn just that little more.

Naturally skillful beginners need only the minimum of guidance as they are quick to teach themselves. Quiet, studious type might even turn up with the whole thing completely mastered. This latter is very rare. There are many graduations between the romping kit-bashing Juniors and the finished product patiently waiting to borrow a copy of the Year Book.

Having reviewed the raw material we must now consider how best to turn such into the competent draughtsmen and craftsmen the hobby needs. (None of this applies to control-line flying which is not real flight and indicates degeneration.)

One soon sees how things are going to go by training beginners to cut and joint balsa properly without damaging themselves or the plan. Clever ones readily understand pre-cementing and splicing. They soon remember to protect the plan with grease or transparent paper. It is more difficult to train people of any age or sex to cut in such a way that a slip of the blade does not cut a hand wide open. All workshop injuries are avoidable.

It is amazing how many beginners seem unable to see straight. I sometimes think the eye has an inherent laziness or stigmatism which only training can cure. They are seldom able to locate pins properly on the plan boards. Models will be spoiled before they learn to connect warps with their having forced components into place instead of fitting everything to exact size.

I do not know what they do in American schools as regards maths, but Scottish youngsters require much demonstration before they learn to connect their purely academic geometry with the parallels, equals, balances and curves of aeromodelling. The cube, circle, triangles, and other special shapes are just as fundamental in our craft. It is only after they appraise all this that they begin to make real headway. By this stage one should ensure that they are learning the terminology and are aware of what dihedral and polydihedral, longerons, L/E, T/E, and spars all represent. Wings have tips, while the vertical stab has a top not a tip. Aeromodellers are popular with their teachers as they can put their knowledge to practical use rather than treat it as raw theory.

Just as discipline is required of Boy Scouts so it is with us. Juniors must be reasonably obedient. With the youngsters this is a problem. It is a good plan to have magazines for them to peruse when they tire as even the keen do. As a last resource I give them muscle-building hand-grips to work off their surplus energy upon. It is useless to lecture or rebuke them as they are inured to it. Stop them if they tap and fidget as it is as bad for your nerves as well as theirs. Show an example yourself by refraining from jingling keys etc. Woolgathering is difficult to cure. They may say "yes" and "no" subconsciously without ever coming out of their day-dreams. Beat this habit by causing them them to repeat key phrases in your instructions word by word. Youngsters can only hold themselves in attention for a short time at first.

There is always research afoot for suitable models for beginners. Novices can do the oddest things to simplest model. Some lose heart because they tackle more than they can cope with. It is thus desirable for them to follow a progressive elementary course. Even if they never continue the hobby in later life, the self restraint and skill required is never wasted.

One Junior I have helped stands out among all others. Willy is an example of what a good trainee should be. He used to come about our club as a very little eight year old Willy, but now he is as big a Willy as I am. At 16 he is now an up and coming Scottish competetion "danger." When he was ten we gave him old models and scrap balsa to play around with. At Christmas and birthdays he used to reduce kits to a sorry state of completion in about three days. (Slow work for a Junior!)

This spring (1957) I asked for a list of his models since he gained membership at twelve by getting over 30 sec. with his first glider. In four years he built 14 models only one being a kit. 10 of them were designs we cooked up ourselves and remaining three were mag. plans. His first folding blade rubber model was drawn up by Willy from specifications I laid down for him. This came at about 13½ years. He had a set of times one day which I could never get. They were 3m 15s, 2m 55s and 7m 10s, and were all flown practically consecutively.

The first glider I drew up for him was slightly bigger than present A-1 size. As he could not keep longerons or spacers whole I let him construct a slim box fuselage of 1/8th sheet sides and 1/16th sheet top and bottom with solid horizontally grained formers. Wings were flat center section with tip dihedral. Rudder was a piece of 1/8th sandwiched between ends of fuselage sides. Wing and stab construction was simple L/E and T/ with two 1/8 sq. spars, flat bottom airfoils, uniform chord and square tips. A stout towhook and metal trim tab consisted the accessories. After a fair covering this primary glider eventually flew better than some of his later efforts. This model served well as a town and trim trainer.

His next two models, built in haste and over confidence were not as good. So we turned to the rubber duration series which is now at the stage where he has three built all alike for comp. work. He had two great difficulties; the propeller and keeping fuselage true. Small fuselages for 2 oz. motors did all right with 1/8 sq. longerons but he has difficulty with those built from 3/32 sq. longerons. Distortion is mainly caused by not setting the locating pins either accurately or in pairs at the spacers when building the fuselage sides. Building Juniors need constant supervision.

His last model under my supervision was a beautiful A-2. Now he dabbles in pylon power jobs and draws up plans for Juniors.

Frank, I was surprised to read in your last note you sent me: "The clubs meet in all sorts of places just to talk things over, but the actual work is at home." All of the N.E. Scottish clubs I know of build com munally like the rooks. You should cross-section the clubs to find out why home builders are in majority. It is bad for the progress to build like a hermit. The complex non-balsa construction of the modern Russian Wakefield could hardly have been worked out by individuals. Team work means progress. In a future Year Book you could include a page or two on running a club workshop.

That is about all I have about training. I said nothing about wood selection, stripping, wire bending, covering, doping, and things like that. There is literature available to cover all these things. After all what I have written is not only for the Juniors but also for the Seniors who are instructing them.

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ONE MODELER'S REFLECTIONS (1908-1958)

by William L. Butler ———————————— Los Angeles, Calif.

"The first powered flight in heavier-than-aircraft was a short one. It spanned 12 seconds, a height of 12 feet and a course of 120 feet—less than the length of a modern transport plane. But in another respect this first flight of Wright Bros. at Kitty Hawk was a long one. It landed on the pages of history." (An excerpt from "The Air Explorer Manual—Boy Scouts of America.)

With this background the writer first took interest in aviation mainly thru reading and pictures in the current periodicals. If only some had been saved. By 1908 the first flying model emerged from the basement work bench. They flew, sometimes, but not far—saying was "you could throw a flat iron further than that flight"—but it flew—rose up so daylight was visible between model and ground. The thrill of seeing something becoming airborne—even after hand launch—was out of this world. Then gliders—usually patterned along the lines of a gull—the indescribable thrill of seeing a swept wing affair—fashioned from spruce, piano wire, silk and shellac—hand launched from a trestle—take hold and glide like a hawk clear across a canyon—several hundred yards—talk about pioneering and ecstasy!

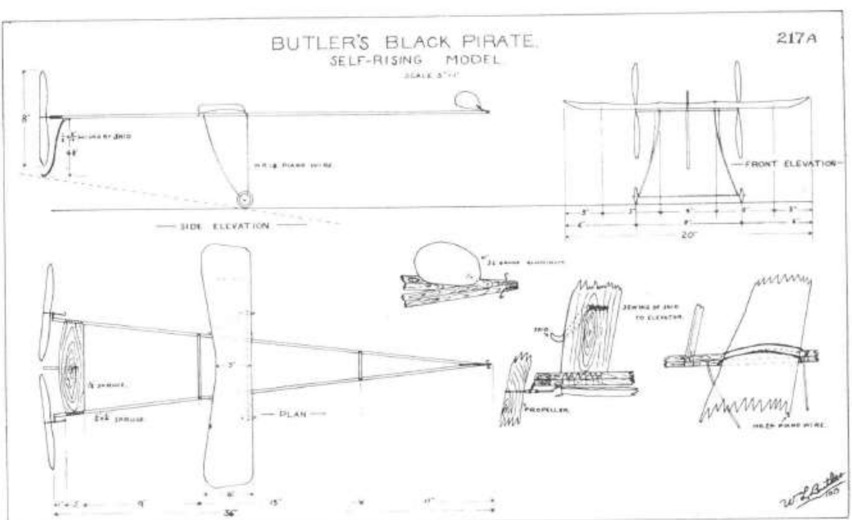
Then my father returned from Paris, France, on a business trip—must have been 1908 or 09—brought back a beautiful single propeller pusher rubber driven canard model—span of rear wing maybe 20 in., front plane or stabilizer maybe 8 in., aluminum tube for fuselage perhaps 30 in. long, prop diameter probably 8 in. Wing leading edges were similar to umbrella ribs and held the silk wings like sails—but it flew very well—possibly 20 seconds. This was another clew that things could fly. From then on life was just one model after another—materials were even purchased to build a man carrying slope glider—fortunately it never was completed—school and finances took care of that.

Then the real thing came to San Francisco—I saw Arch Hoxey fly his Wright biplane at Tanforen near San Francisco. Then Frenchman Hubert Latham flew his Antionette monoplane thru the Golden Gate over San Francisco bay—it actually rose off the ground. By 1910 aviation was going like a forest fire insofar as my thinking was concerned. Big meets with many experimental planes. Bleriot, Wrights and Curtiss appeared near San Francisco and around the Los Angeles area—very close to where this is being written.

At high school in San Francisco the POLYTECHNIC MODEL AIRPLANE CLUB was founded. We held contests back in 1910-13 much the same as we have them today. Distance was the main event. The "A" frame canard type was the most successful type and as popular as the tractor type is today. My innovation was to eliminate the front stabilizer and replace it by a conventional type behind the wing and just in front of the twin propellers. Result was a faster, high flying model which could make distance. We knew nothing about thermals those days—pilots called them "air pockets."

Then in 1913 a group from our club met on the Ingleside Golf Course—south of San Francisco—for the purpose of holding record trials. Just like we would do today and we even called them "record trials." My new twin pusher canard had many new features—principally light weight construction—and I did not know it but it had some qualities of a soarer. Best time for any model those days was around one minute. Three timers were all set with stop-watches. I wound my lubed rubber motors with a rebuilt egg-beater scrounged from the home kitchen—launched my ship—it flew breathlessly perfect. Approximately 60 seconds later the props were unwound with rubber sagging—the model started gliding in perfect 200 ft. circles in the nearly calm air and perfect sunshine. It seemed to never come down until it finally touched 173 seconds later. Records and photos were sent to the Philadelphia Model Aero Club and was acknowledged as a world's record. See Zaic's Year Book for 1936 for plans. This practically ended my modelling career as I graduated from high school and found myself with a job as surveyor preparatory to entering the University of California at Berkeley.

Remember having had the record holding model in my frat house—also flying it once, old rubber, etc. the old zip was not there so it was laid away and I never saw it again. Busy college years followed, aviation went into background. Came War I—physical injury kept me out of the service although the Navy offered me a commission as Lt. jg. Went to work for Hall Scott Motors—building airplane engines



Then to Detroit on the French LePere biplane, to McCook Field, Dayton, Ohio where I made the acquaintance of Lt. Charlie Grant who was experimenting with model planes in 1919. They flew very well and he went into the business. Although I helped him in flying demonstrations —somehow the old medeller's spark was just not in me. Took no interest to the point of becoming active. Year later in 1928 in Seattle there were some model demonstrations at Boeing where I was working. But still not interested. Just resting on the old laurels, I fiuess.

In 1935 I was in Hartford, Connecticut—standing on the street watching a parade with wife and two little sons. Happened to look at a model magazine on the portable newsstand—**M.A.N.**—Charles Grant, Editor—read it from cover to cover—10-12 minutes duration—unbelievable—how'd they do it? Wrote to Charlie—reply the usual postcard —remember 'em?—explained the long durations were due to thermals. Never heard of them. But the chips were down. Life has never been the same since. From then on as many modelers know I have built and flown nearly every type of model craft that would fly, and right now—being a radio ham since 1928—the phase of flying 'em with a control system aboard where the last minute of flight was as good as the first and the model would go someplace other than where it would have gone without the R/C aboard, is all the spare time available.

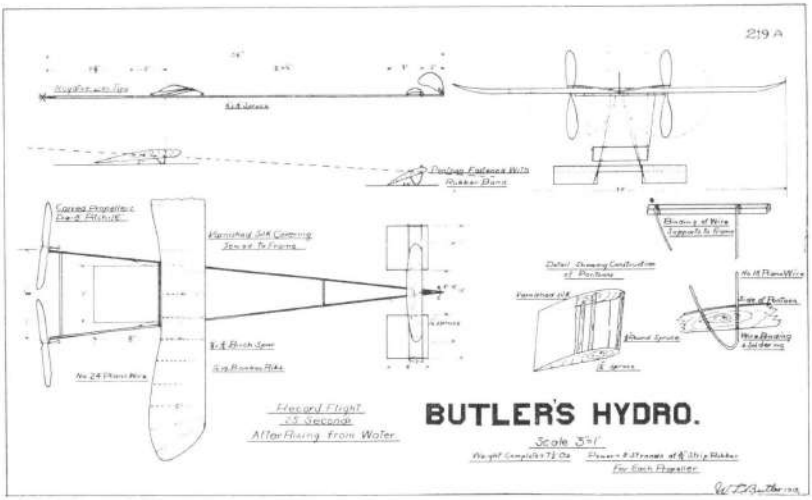
This second phase of modelling activity has paid off in big dividends. The absorbing challenge of building and flying is as satisfying as any activity in existence. Knowledge gained has contributed greatly to my vocation for many years as an aircraft inspector and for the past 18 years as an aeronautical engineer.

In the field of materials used in the construction from fabrics and dopes to steels and non-ferrous alloys model building has given me a first hand practical knowledge which helped a lot in applying information from books and specifications. As an engineer an applicable understanding of the basic laws of physics, electronics and aerodynamics have been grasped much better than thru having struggled with them in building and flying models.

During 30 years working in aircraft factories it is my observation that the active modellers have gone to the key positions much more frequently than those without such experience. The training acquired in making a radio control model fly satisfactorily certainly fits in when it comes to absorbing training either in the armed forces or in a factory. I have seen it work time after time. Have been asked, "Where did you get your understanding of aerodynamics? They did not have any such course when you went to school." My answer is thru model aircraft.

Model building led to a career of continuous activity with the Boy Scouts of America from 1940 to the present time. Have, been adult leader of one of the most successful Air Explorer Squadron in the country. Many boys are now active pilots for the major airlines who started thru connection with my activity as an air scout leader and modeller. My son Jack was one of the most successful junior modellers in the country and is now training as pilot for one of the major airlines.

In answer to your query, Frank, I would say, "Yes, model aircraft activity pays off in many practical phases as well as the thrills and joys of flying them."



FROM MY EXPERIENCE by B. Poythress Kingston, N. Y.

The beginner's model is, I think, the missing link in today's model business. The simple, easy to construct model that will fly, no matter how sloppy it is put together, is definitely needed. I have noticed this lack in the past when I tried to teach model building in the Newport News Community Center.

The kids who want to learn, still need guidance, but where can they get it? If no old-time model builders are available, who can teach them—then what? The organizations that try to set-up something like this are stopped before they start, usually because some volunteers with ability to get along with and teach kids come to the point where they do not know what to teach, and as a result, the program folds up.

What I am trying to say is that a beginner's model should not only have all the simple aforementioned attributes, but the instructions, particularly on flying and adjusting, should be clear enough so that an adult with as little effort as possible can understand and follow them.

My personal belief is that the beginner's model is harder to design in some respect than a good contest job. All models are a series of compromises, but I believe that the beginner's ship has more unrelenting ones.

INDIVIDUAL RESULTS FOR THE WAKEFIELD CUP

	Name	Country	1.	2.	3.	4.	5.	Tota
1.	Petersson, L.	Sweden	180	180	180	180	159	879
2.	Kothe, H. (P) A. Hakansson	U.S.A.	180	180	180	180	154	874
3.	O'Donnell, John	Gt. Britain	180	180	180	151	180	871
3.	Knudser, Erik	Denmark	180	166	180	165	180	871
5.	Smirnov, E.	Russia	180	163	167	160	180	850
6.	O'Donnell, H.	Gt. Britain	178	175	142	180	173	848
7.	Ahman, R.	Sweden	135	154	180	180	180	829
8.	Ivannikov, I.	Russia	180	180	180	131	140	811
9.	Kolpakov, V.	Russia	180	143	126	180	180	809
10.	Hyvarinen, R.	Finland	166	180	172	132	158	808
11.	Smolders, J.	Holland	177	165	155	160	147	804
12.	Haag, R.	Sweden	180	141	145	180	155	801
13.	Kolb, J.	U.S.A.	180	180	110	163	155	788
14.	Scardicchio, V.	Italy	180	180	127	180	118	785
15.	Montplaisir, C. (P) A. Blomgren	U.S.A.	139	180	180	180	103	782
16.	Cizek, R.	Czech.	180	171	176	103	136	766
17.	Lefever, G. J.	Gt. Britain	98	180	147	180	145	750
18.	Alinari, A.	Italy	156	180	111	130	146	723
19.	Giudici, G.	France	132	180	126	116	168	722
20.	Fea, G.	Italy	180	180	180	180	--	720
21.	Hertsch, K.	Germany	180	180	99	118	133	710
22.	Guilloteau, R.	France	132	177	100	125	171	705
23.	Sorensen, N.	Denmark	149	180	111	130	124	694
24.	Altmann, J.	Germany	180	142	180	161	25	688
25.	Hamalainen, E.	Finland	150	144	145	126	110	675
26.	Dormann, H.	Germany	159	147	107	128	128	669
27.	Cassi, G.	Italy	151	178	89	87	159	664
28.	Molbach, T.	Norway	100	180	134	131	98	643
29.	Nienstedt, E.	Denmark	149	130	—	180	180	639
30.	Hemola, J.	Czech.	146	69	124	180	109	628
31.	Coughlin, G.	U.S.A.	158	127	112	137	93	627
32.	Heidmuller, B. (P) G. Behrens	Germany	150	129	54	180	100	613
33.	Coates, F. (P) C. Moberg	Canada	89	156	180	180	—	605
34.	Revell, H.	Gt. Britain	141	147	91	104	121	604
35.	Bausch, L.	Holland	110	133	134	139	87	603
36.	Matveev, V.	Russia	180	180	—	180	—	540
37.	Wong, D. (P) L. Andersson	N. Zealand	99	180	120	82	37	518
38.	Takko, S.	Finland	93	153	141	130	—	517
39.	Lifka, L.	Czech.	145	125	88	88	69	515
40.	Bluhm, P.	France	—	102	134	107	149	492
41.	Knoos, S.	Sweden	165	144	114	58	—	481
42.	Burger, C.	Holland	132	103	120	—	118	473
43.	Bobkowski, A.	Guatemala	126	180	167	—	—	473
44.	Nurminen, S.	Finland	44	151	113	93	67	468
45.	Heesemans, R.	Holland	122	107	60	39	136	464
46.	Widell, K. E.	Denmark	161	75	169	45	—	450
47.	Nonaka, Y. (P) N. Hollander	Japan	137	94	121	23	58	433
48.	Alfare, A. (P) C. Sunstedt	Guatemala	33	117	121	150	—	421
49.	Mackenzie, D. (P) L. Hansson	Canada	132	—	145	127	—	404
50.	Popelar, V.	Czech.	158	—	—	89	140	387
51.	Viggiano, O. (P) C. Haag	Argentine	40	167	162	—	—	369
52.	Baker, B.	Australia	180	—	159	—	—	339
53.	Gordon, R. (P) M. Blomquist	Canada	180	139	—	—	—	319
54.	Nonaka, S. (P) R. Johansson	Japan	143	92	—	—	—	235
55.	Leong, A. (P) H. Schmiterlow	N. Zealand	93	85	—	—	—	178
56.	Groves, K. (P) G. Johansson	Canada	68	—	78	—	—	146
57.	Heirct, J.	Norway	86	—	—	—	—	86
58.	Macaulay, A. (P) B. Blomberg	New Zealand	—	—	23	—	—	23

(P) indicates proxy flown

TEAM RESULTS FOR THE F.M.A. CUP

1.	Sweden	2509
2.	Russia	2470
3.	Gt. Britain	2469
4.	U.S.A.	2444
5.	Italy	2228
6.	Denmark	2204
7.	Germany	2067
8.	Finland	2000
9.	France	1919
10.	Czechoslovakia	1909
11.	Holland	1880
12.	Canada	1328
13.	Guatemala	894
14.	Norway	729
15.	New Zealand	724
16.	Japan	668
17.	Argentine	369
18.	Australia	339

INDIVIDUAL RESULTS FOR THE SWEDISH CUP

	Name	Country	1.	2.	3.	4.	5.	Total
1.	Brems	Belgium	145	180	180	180	168	853
2.	Amor	Gt. Britain	180	180	180	180	115	835
3.	Thoman	Switzerland	139	142	180	180	180	821
4.	Hansen	Denmark	180	180	160	180	119	819
5.	Kalen	Sweden	97	180	180	180	180	817
6.	Spulak	Czechoslovakia	155	132	180	167	180	814
7.	Jones	Canada	81	180	180	170	180	791
8.	Horyna	Czechoslovakia	177	138	142	180	152	789
9.	Larsson	Sweden	86	180	180	157	180	783
10.	Hajek	Czechoslovakia	148	180	180	180	89	777
11.	Stepanek	Czechoslovakia	142	180	125	163	160	770
12.	Roser	Hungary	180	67	180	180	163	770
13.	Papendorf	Germany	180	147	180	101	157	765
14.	Nilsen	Denmark	76	180	180	180	141	757
15.	Wheeler (P) Zaunelli	New Zealand	180	180	180	111	102	753
16.	Gussenhoven	Holland	102	180	156	137	177	752
17.	Lindner	Germany	180	165	180	114	107	746
18.	Templier	France	120	180	180	123	142	745
19.	Rodoczi	Hungary	180	180	146	102	122	730
20.	Schnabel	Switzerland	152	180	145	105	146	728
21.	Simon	Hungary	180	95	100	180	166	711
22.	Giusti	Italy	74	180	180	99	178	711
23.	Watson (P) Zulberti	New Zealand	144	138	69	180	180	711
24.	Norbert	Hungary	180	180	73	99	172	704
25.	Jedelshy	Austria	100	158	135	180	130	703
26.	Terrill	New Zealand	180	64	180	180	97	701
27.	Ito Kinzol (P) Varetto	Japan	180	92	180	131	112	695
28.	Joansson	Sweden	180	167	61	180	105	693
29.	Maes	Belgium	66	180	180	119	144	689
30.	Esuelt	Holland	130	180	180	67	131	688
31.	Bucher	Switzerland	100	180	44	180	180	684
32.	Aubertin	Monaco	180	158	85	65	180	668
33.	Mackenzie	Canada	109	83	180	154	139	665
34.	Boxall	Gt. Britain	180	84	180	76	145	665
35.	Wilkin	Belgium	93	60	180	180	150	663
36.	Goett	France	126	83	180	164	106	659
37.	Guillotesu	France	159	94	97	180	126	656
38.	Czinczel	Germany	180	36	104	161	168	649
39.	Posa	Italy	180	80	180	81	114	635
40.	Bilgri (P) Scardicchio	U.S.A.	87	134	65	180	165	631
41.	Hansen	Denmark	180	97	180	33	135	625
42.	Nironi	Italy	180	114	78	101	135	608
43.	Jacob	Israel	104	165	104	78	149	600
44.	Hovikawa (P) Fea	Japan	180	84	94	58	179	595
45.	Sugden (P) Soave	Canada	180	85	49	100	180	594
46.	Hauenstein	Switzerland	100	51	180	118	141	590
47.	Hammer	Germany	104	107	27	168	168	574
48.	Hermes (P) Semenzato	U.S.A.	102	72	180	90	127	571
49.	Willis	Gt. Britain	130	100	180	54	107	571
50.	Buiter	Holland	149	70	141	73	120	553
51.	Severs	Holland	127	60	109	180	75	551
52.	Fontaine	France	93	41	162	105	150	551
53.	Wastl	Austria	159	94	125	86	55	519
54.	Caprara	Italy	112	79	108	100	118	517
55.	Hasegawa (P) Buglioni	Japan	172	143	48	44	110	517
56.	Roberts	Gt. Britain	105	54	124	123	105	511
57.	Czepa	Austria	129	92	—	142	145	508
58.	Petit	Belgium	180	61	34	129	82	486
59.	Karp (P) Lusso	Israel	39	58	180	31	178	486
60.	Hartill (P) Cassi	U.S.A.	180	68	55	127	51	481
61.	Howlett (P) Ranocchia	New Zealand	89	108	64	98	93	452
62.	Exell	Austria	40	43	144	180	40	447
63.	Yllan	Spain	116	126	59	140	—	441
64.	Aubertin	Monaco	58	180	59	53	81	431
65.	Fredericksen	Denmark	84	65	62	135	57	403
66.	Moulton (P) Correnti	U.S.A.	—	39	180	41	132	392

(P) indicates proxy flown

TEAM RESULTS FOR THE BELGIUM DAUMERIE TROPHY

1. Czechoslovakia
2. Sweden
3. Switzerland
4. Hungary
5. Belgium
6. Denmark
7. New Zealand
8. Germany
9. Gt. Britain
10. France
11. Canada
12. Holland
13. Italy
14. Japan
15. Austria
16. U.S.A.

WORLD POWER CHAMPIONSHIPS, 1956
RESULTS

	Name	Country	1	2	3	4	5	Total
1.	Draper, R.	G.B.	3:00	3:00	3:00	3:00	3:00	*20:20
2.	Posner, D.	G.B.	3:00	3:00	3:00	3:00	3:00	*19:52
3.	Conover, L. H. (Lanfranchi)	U.S.A.	3:00	3:00	3:00	3:00	3:00	*19:15
4.	Fressl, E.	Jugo.	3:00	3:00	3:00	2:57	3:00	14:57
5.	Bergamaschi, C.	Italy	3:00	2:55	3:00	3:00	3:00	14:55
6.	Thompson, J.	Ireland	2:53	3:00	3:00	3:00	3:00	14:53
7.	Fiks, G.	Holland	3:00	2:36	3:00	3:00	3:00	14:36
8.	Schenker, R.	Switz.	3:00	3:00	2:32	2:56	3:00	14:28
9.	Rudolph, Frau M.	Germany	3:00	3:00	2:34	2:41	3:00	14:75
10.	Morelli, A.	Ireland	2:11	2:51	2:58	3:00	3:00	14:00
11.	Asano, T. (P. Manville)	Japan	2:21	3:00	2:26	3:00	3:00	13:47
12.	Gaster, M.	G.B.	3:00	1:18	3:00	3:00	3:00	13:18
13.	Huffman, W. F. (G. Coughlin)	U.S.A.	2:43	2:54	2:02	2:30	2:51	13:00
14.	Masek, J.	Czech.	3:00	3:00	3:00	1:34	2:22	12:56
15.	Eisen, J. (F. McNulty)	Canada	3:00	3:00	2:46	2:16	1:50	12:52
16.	Pfenninger, M.	Switz.	1:50	3:00	2:05	3:00	2:56	12:51
17.	Sladek, R. (V. Jays)	U.S.A.	3:00	2:24	1:26	3:00	3:00	12:50
18.	Bausch, L.	Holland	2:22	1:53	2:45	3:00	2:49	12:49
19.	Piesk, L.	Germany	3:00	1:55	2:27	3:00	2:23	12:45
20.	S'Jongers, J.	Belgium	3:00	2:05	2:04	3:00	2:33	12:42
21.	Osterholm, S.	Finland	3:00	3:00	1:53	2:01	2:32	12:26
22.	Hormann, G.	Austria	–:29	2:56	3:00	3:00	3:00	12:25
23.	Cerney, R.	Czech.	2:42	–:42	3:00	3:00	3:00	12:24
24.	Friis, H. O.	Sweden	–:21	2:57	3:00	3:00	3:00	12:18
25.	Ranta, A. (J. Bickerstaffe)	Canada	3:00	3:00	0:0	3:00	3:00	12:00
26.	Domberger, H.	Austria	3:00	2:20	1:46	2:25	2:24	11:55
27.	Teunissen, A.	Holland	2:20	3:00	1:45	2:30	2:15	11:50
28.	Hajek, V.	Czech.	2:48	3:00	3:00	0:0	3:00	11:48
29.	Upson, G.	G.B.	1:50	2:43	1:55	3:00	1:56	11:24
30.	Houtrelle, H.	Belgium	1:51	1:48	2:03	3:00	2:13	10:55
31.	Hutjes, W.	Holland	1:43	2:11	2:33	2:13	2:08	10:48
32.	Manninen, P. (J. Jaaskelainen)	Finland	3:00	1:58	1:34	1:26	2:39	10:37
33.	Raulio, H.	Finland	1:35	2:05	2:28	1:12	3:00	10:20
34.	Ruzek, L.	Czech.	1:59	2:16	1:58	2:17	1:49	10:19
35.	Woods, D.	Ireland	1:50	1:38	–:56	3:00	2:53	10:17
36.	Zigit, D.	Jugo.	0:00	3:00	2:13	2:50	2:02	10:05
37.	Leppert, H.	Germany	3:00	1:08	2:24	2:25	0:48	9:45
38.	Hoyer, E.	Austria	2:43	1:43	2:38	1:50	0:00	8:54
39.	Baker, R. S. B.	Australia	1:25	1:17	2:17	1:27	2:14	8:40
40.	Zapata, R.	Italy	3:00	0:0	1:45	1:44	2:08	8:37
41.	Lippens, G.	Belgium	1:35	1:34	1:28	1:44	2:03	8:24
42.	Hagel, R.	Sweden	2:20	3:00	0:0	0:0	2:37	7:57
43.	Jeanne, L.	Belgium	0:0	3:00	1:32	1:42	1:28	7:42
44.	Grunbaum, P.	Austria	1:38	1:51	1:27	1:14	1:17	7:27
45.	Monti, F.	Italy	1:21	1:34	1:08	1:39	1:27	7:09
46.	Gunic, B.	Jugo.	1:27	0:0	2:38	3:00	0:0	7:05
47.	Kmoch, V.	Jugo.	–:33	3:00	0:0	1:22	1:43	6:38
48.	Lorimer, E. (G. French)	Canada	–:18	4:20	1:33	1:13	1:22	6:17
49.	Hamma, W.	Germany	3:00	3:00	0:00	—	—	6:00
50.	Etherington, W.	Canada	1:12	1:11	1:11	1:32	0:0	5:06
51.	Bacchi, R.	Italy	3:00	0:24	0:00	—	—	3:24
52.	Maibach, F.	Switz.	3:00	0:00	0:00	0:00	0:00	3:00
53.	Hartill, W. (N. Green)	U.S.A.	2:23	–:21	0:0	0:0	0:0	2:44
54.	Browne, D.	Ireland	0:30	—	—	—	—	–:30
55.	Bird, R. E.	Australia	—	—	—	—	—	—
56.	Schiltknecht, F.	Switz.	—	—	—	—	—	—
57.	Pimenoff, S.	Finland	—	—	—	—	—	—

*Includes fly-off time.

TEAM RESULTS FOR FRANJO KLUZ CUP

1.	Great Britain	2598
2.	U.S.A.	2450
3.	Holland	2355
4.	Ireland	2350
5.	Czechoslovakia	2228
6.	Germany	2205
7.	Finland	2003
8.	Austria	1994
9.	Jugoslavia	1927
10.	Belgium	1931
11.	Canada	1869
12.	Italy	1641
13.	Switzerland	1819
14.	Sweden	1215
15.	Japan	870
16.	Australia	520

1956 WORLD CHAMPIONSHIPS

"MODEL AIRCRAFT"

WAKEFIELD Total Surface Area (Projected): 17 to 19 sq. dm. (263.5 to 294.5 sq. in.)—Min. Total Wt.: 230 grams (8.113 ozs.)

NORDIC A-2 Total Surface Area (Projected): 32 to 34 sq. dm. (495.9 to 526.9 sq. in.) Min Total Wt. 410 grams (14.46 ozs.)

FAI POWER Total Min. Wt. in grams: 300 x cm of engine. (173.4 ozs. per cu. in.) Max. Displace. 2.5 (0.1525 cu. in.) Max. Engine Run: 15 sec.—Min. Surface Load: 20 grams per sq. dm. of total surface area (6.55 ozs. per sq. ft.)

1957-INDIVIDUAL GLIDER CHAMPIONSHIP RESULTS

Pl.	Competitor	Nation	1st	2nd	3rd	4th	5th	Tot.
1.	S. Babic	Yugoslavia	180	180	180	180	180	900
2.	Sokolov	Russia	180	180	180	149	165	854
3.	M. Hadzovic	Yugoslavia	180	180	180	180	117	837
4.	Simonov	Russia	180	180	180	115	180	835
5.	F. Zsembery	Hungary	180	180	180	180	114	834
6.	J. Michalek	Czechoslovakia	180	91	180	180	180	811
7.	H. Kuns	W. Germany	180	180	180	80	180	800
8.	J. Hannay	Great Britain	75	180	180	180	180	795
9.	H. Hansen	Denmark	180	152	103	180	180	795
10.	E. Medaglia	Italy	180	180	180	94	158	792
11.	Tisutin	Russia	171	73	180	180	180	784
12.	H. Thomas	Canada	155	101	180	180	164	780
13.	C. Simon	Hungary	180	180	66	155	180	761
14.	E. Huge	Belgium	180	180	118	101	167	748
15.	F. Christensen	U.S.A.	180	180	66	180	130	736
16.	M. Vuletic	Yugoslavia	180	180	92	97	180	729
17.	A. Kalen	Sweden	61	180	180	173	134	728
18.	V. Spulak	Czechoslovakia	175	88	148	136	180	727
19.	Per. S. Knoos	Sweden	180	180	70	180	113	723
20.	C. Varetto	Italy	180	180	153	39	167	719
21.	D. Cieslelski	W. Germany	180	180	53	123	180	716
22.	B. Hansen	Denmark	180	77	150	128	180	715
23.	H. Hajek	Czechoslovakia	109	180	180	180	54	703
24.	H. Neuman	W. Germany	180	145	180	73	120	698
25.	H. Nielsen	Denmark	180	173	104	180	60	697
26.	G. Gindici	France	180	160	48	121	180	689
26.	K. Csepa	Austria	94	170	133	112	180	689
28.	P. Hoadley	U.S.A.	141	101	180	124	136	682
29.	E. Wiggins	Great Britain	180	180	45	140	135	680
29.	N. Nilsson	Sweden	180	37	180	180	103	680
31.	L. Van Camp	Belgium	180	130	79	180	107	676
32.	W. Hach	Austria	180	180	127	180	6	673
33.	L. Bausch	Holland	95	77	180	180	139	671
34.	L. Zengen	W. Germany	122	167	120	75	180	664
35.	J. Daley (G. Ritz)	U.S.A.	72	48	180	180	180	660
36.	J. Crawford	Canada	180	180	55	63	180	658
37.	L. Tlapak	Austria	180	154	111	127	78	650
38.	S. Niemela	Finland	41	180	102	141	180	644
39.	J. Martin	France	180	75	180	158	48	641
40.	S. Takko	Finland	77	107	118	180	154	636
40.	E. Macejevski	Poland	180	75	180	21	180	636
42.	A. Ree	Hungary	71	161	89	133	180	634
43.	V. Horyna	Czechoslovakia	113	128	180	148	63	630
44.	J. Dihn	Poland	180	128	82	156	80	626
45.	J. Fontaine	France	90	157	113	180	83	623
46.	R. Burgess	Great Britain	87	180	180	86	88	621
47.	F. Frederiksen	Denmark	180	25	180	180	52	617
48.	A. Valjeev	Bulgaria	166	180	45	104	121	616
49.	B. Tyrrell	Great Britain	180	96	52	106	180	614
50.	A. Possenti	Italy	180	93	148	70	121	612
51.	R. Hagel	Sweden	87	101	180	132	109	609
52.	J. Jastrembski	Poland	63	180	126	114	116	599
53.	A. Mirdev	Bulgaria	113	113	124	106	139	597
54.	R. Guilloteau	France	126	140	180	79	71	596
55.	Vasiljev	Russia	180	180	77	92	58	587
56.	R. Howie (Feigl)	Australia	180	180	122	56	45	583
57.	J. Laframboise (Sedivec)	Canada	41	151	180	88	114	574
58.	E. Hamalainen	Finland	32	180	99	62	180	553
58.	N. Parucha	Poland	180	69	85	102	117	553
60.	N. Rosen	Hungary	36	71	180	180	84	551
61.	P. Karamitev	Bulgaria	180	43	155	68	99	545
62.	A. Wilkins	Belgium	81	93	180	68	118	540
63.	P. Petrovski	Yugoslavia	180	26	118	71	130	525
63.	A. Buiter	Holland	180	56	110	57	122	525
63.	A. Tennissen	Holland	107	168	53	74	123	525
66.	M. Stojanov	Bulgaria	45	119	180	63	116	523
67.	P. Smith	Ireland	108	38	180	84	111	521
68.	S. Schirru	Italy	41	59	180	78	103	461
69.	W. Etherington (Prochazka)	Canada	155	92	52	49	86	434
70.	C. Cornelissen	Holland	64	108	73	98	84	427
71.	G. Thomas	U.S.A.	61	180	37	81	67	426
72.	J. Maes	Belgium	106	27	48	94	39	314
73.	M. Schlederer	Austria	0	69	39	66	89	263

1957 GLIDER CHAMPIONSHIP TEAM RESULTS

1.	Russia	2,473	11.	Austria	2,012
2.	Yugoslavia	2,466	11.	Canada	2,012
3.	Czechoslovakia	2,241	13.	Belgium	1,964
4.	Hungary	2,229	14.	France	1,953
5.	West Germany	2,214	15.	Poland	1,861
6.	Denmark	2,207	16.	Finland	1,813
7.	Sweden	2,131	17.	Bulgaria	1,758
8.	Italy	2,123	18.	Holland	1,721
9.	Great Britain	2,096	19.	Australia	583
10.	U.S.A.	2,078	20.	Ireland	521

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We enjoy corresponding with you, and talking you into sending plans and manuscrip, and assembling the material. But when it comes to drawing more and more plans. . . .

We managed to arrange with several expert model draftsmen all over the world to do the most important part of the book, namely, the plans. To help these draftsmen (some of them do not speak English as well as you do) present your design in all its glory, please follow these suggestions:

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3. Airfoils full size. Special features whatever size you like. Do not worry about arrangement. We will arrange to suit space.
4. Use medium pencil so that lines can be seen through tracing paper.
5. Put in all textual information you wish on plans.

As you can see, the basic idea behind this plan is to obtain scaled drawings so that we can trace them in ink on tracing paper placed directly over your drawings. Believe us, scaling full size or working drawings or trying to make accurate drawings from sketches can be mean on nerves from 10 p.m. to 3 a.m., the only time we can afford.

P.S. Under no circumstances should you let the above requests stop you from sending plans or contributions if you cannot redraw them. But we hope that most of you can. Thanks!

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COVER – BJÖRN KARLSTRÖM

Dear Friends:

Here is another Year Book. It was an unusually long job; over 16 months of spare time .Because of this, some of the plans and articles may seem outdated, but we should remember that one of the Year Books' aims is to record the history of developments in our mutual hobby, model airplanes.

We are happy to report that this book is made up mainly with the contributions from you. This is a good sign for the future of Model Aeronautics and the Year Books.

There is one point about which we are not too happy; this edition required too much of our spare time. It made us realize that we should not subordinate all of our other activitiex and interests, including the building and flying of models, to the production of the Year Books . Yet, at the same time, we also realize that if we were to give up the Year Books, we would lose our personal identity in the model world. One solution of this problem will be to get more outside help.

Since we feel that we can depend on obtaining plans and articles from the Year Book readers the main labor is the preparation of the material received into a form that can be used for publication. This is where we come in.

The financial return from the Year Book does not allow any cash outlay for anything else but work that we cannot do ourselves. Hence, the great amount of time required to complete a Year Book .--We are now also reconciled to the fact that the Year Book circulation is limited, and that it will increase very slowly. From the financial viewpoint, therefore, the situation is not too happy. However, luckily, our personal economical future looks good at this time, and we will not hesitate to use our personal income to help in the preparation of the future Year Books. We are sure that someday the accounts will balance.

We hope that you will continue to be as helpful as you have been in the past in contributing plans, articles and suggestions, and in promoting the circulation. In return we will continue the Year Book publication and endeavor to be more timely with the next edition.

Thanks!

Frank Zaic

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