Trimming & Flying P-30s

By Chris Matsuno, Rubber-Power Contributing Editor

"Spring has sprung,
the grass has riz,
I wonder where my P-30 is"
Anonymous

It is P-30 time. Easily and quickly built, and a lot of fun, this is a very popular design. The following article by Rubber-Power Contributing Editor, Chris Matsuno, should help you trim and fly your P-30, where it be old or new.

And, in case you can't find your old one, and want to build a new one, three plans are included here.--ed.

In the relatively few years since its inception, P-30 has become the most popular outdoor rubber event.

Among its attractions are its simplicity (no propellor to carve), economy and relative ruggedness despite its light weight.

Few changes to the original rules have been required. A minimum weight to discourage Pennyplane-like models was instituted. Props may now be trimmed to remove flashing, balanced by adding weight, and hubs may be drilled for bushings. The intent of these rules is clear, and problems with interpretations have been almost non-existent.

This has resulted in a class with a wide range of designs--fast climb, long motor run, single fin, sub-fin, twin fins, flying wings, etc. This issue includes a number of models which display some of the varying design philosophies and construction methods in use, and also illustrate the international acceptance of the event.

The purpose of this article is to provide the novice with some tips for preparing and trimming a P-30 model. It is assumed that the reader is familiar with basic modeling terms. It is further assumed that we are dealing with a conventional tractor model. If you like canards or flying wings, you're on your own.

There are a number of variables which affect the trimming of a rubber model such as a P-30, Coupe, Wakefield or Mulvihill. There are:

1) Center of Gravity (CG)
2) Wing and stab warps
3) Wing incidence (The relative angle between the wing and stab)
4) Stab incidence (is called decalage)
5) Stab tilt
6) Rudder for glide
7) Thrust angle

Some of these variables have a greater effect on the power phase of the flight, some have a greater effect on the glide, and some effect both.

If you have built a model from a kit or plan, these variables are probably indicated and should provide a good starting point. Presumably the model was flown using the adjustments shown on the plans. However, differences in weight and warps may require changes to the original adjustments.

The CG With all these things to consider, where do we start? I prefer to begin with setting the CG.

For a relatively short-coupled model like a P-30, a 50%-70% CG seems to be the normal range.

If the CG is too far forward, the model will need more decalage to glide properly and will tend to be loopy under power. If the CG is too far back, the model will require less decalage for the glide and a steeper climb may be possible, but the model may not have adequate longitudinal stability. If it gets into a dive or spiral, it may take a long time to pull out, or in the worst case, it may not pull out at all.

Plans

The three P-30 plans that accompany this article are a representation of the class. There are probably as many P-30 designs and variations as NFFS has free flighters.

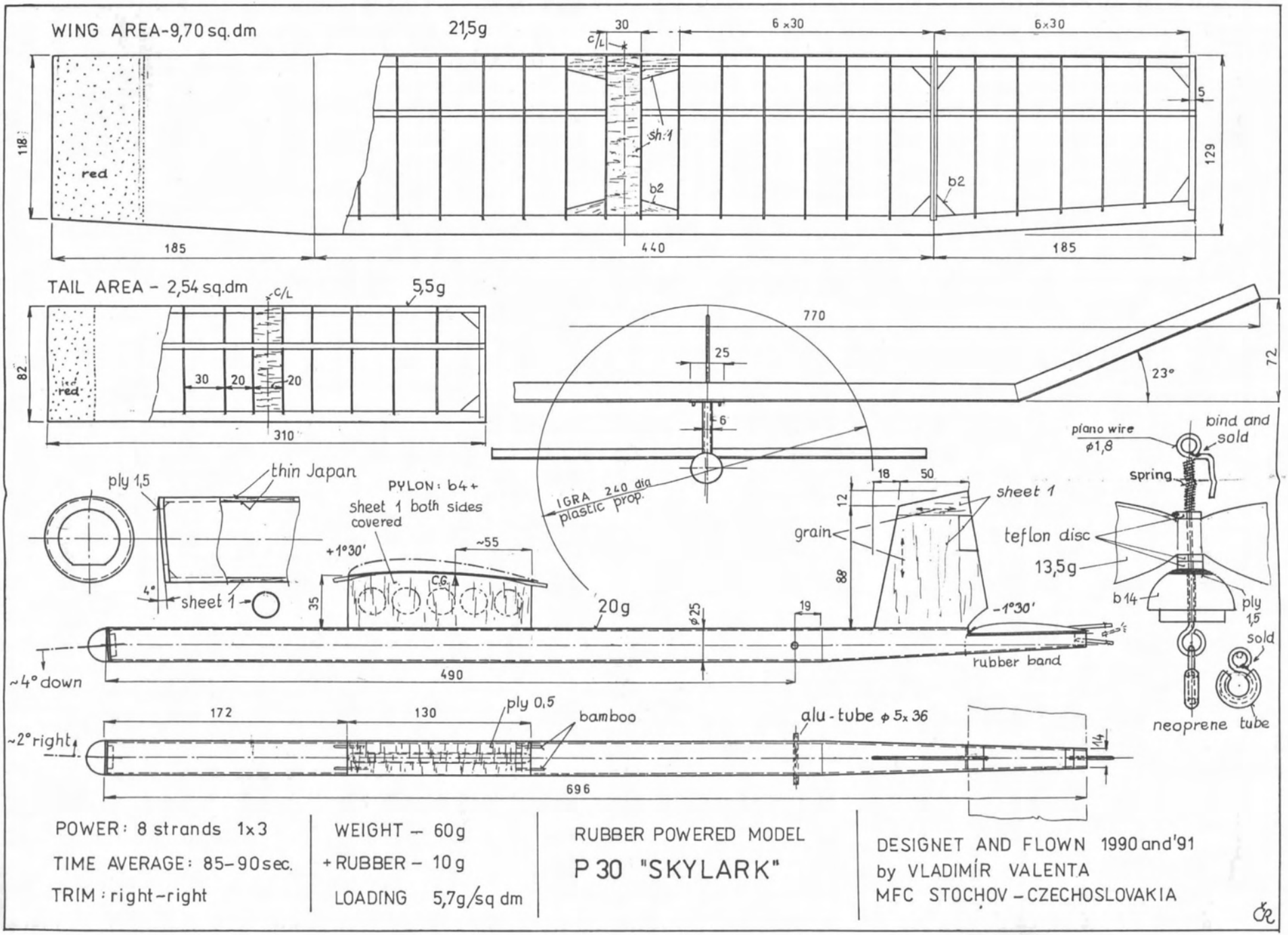
The ICER P-30 first appeared in Flyoff, *Spring 1988 issue.*

The Whirley and the Czech model, Skylark, were both drawn by Rad Cizek.

Most plans and instructions advise you not to glue the pylon onto the fuselage until you have completed all parts of the model. Assemble the model including a motor, and use rubber bands or tape to hold the pylon on the fuselage. Move the pylon and wing until the model balances at the CG selected, then glue the pylon to the fuselage.

Alternatively, you might consider building an adjustable pylon, one that slides back and forth on guides. All my models are built this way, as I find it simplifies trimming and allows flexibility in changing the CG for varying flying conditions. When it's calm, the pylon is moved forward to shift the CG rearward. In windy conditions, the pylon is moved rearward to shift the CG forward.

Warps Next, check the flying surfaces for warps. The stab should be flat. In practice, it is not unusual for the trailing edge tips to be bowed upward slightly due to the tension caused by shrinking the tissue. This can be tolerated if the tips are bowed up evenly. If not remove the warps before flying. If the stab has a major warp that cannot be straightened out, discard the stab and build a new one. Don't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TRIM: right-right
WEIGHT - 60g
+RUBBER - 10g
LOADING 5,7g/sq dm
RUBBER POWERED MODEL
P 30 "SKYLARK"
DESIGNET AND FLOWN 1990 and '91
by VLADIMÍR VALENTA
MFC STOCHOV - CZECHOSLOVAKIA

waste your time trying to trim a model with a warped stab.

The wing should have the warps shown on the plans, if any. Most larger rubber models require a combination of warps: Right wing wash-in (looking at the wing from the front, the trailing edge is lower than the leading edge) and right and left tip wash-out (looking at the wing from the front, the leading edge is lower than the trailing edge).

Generally, if you can trim a model to fly without any warps, that is preferable because it is easier to check and maintain a wing that is flat, rather than to maintain the proper warps.

Many P-30s seem to fly well without any wing warps. If your models' warps do not match the warps indicated on the plans, correct the warps before trying to fly the model. In particular, the following are no-no's: right wing wash-out, left wing wash-in, and tip wash-in.

Don't forget to check the fin for warps also. A warped fin will really cause problems under power.

Most of us would rather fly than build, and it is really difficult to resist taking the model out to fly once it is completed. I have observed people saying "I know there are some warps I have to remove, but I just had to put a few flight on the model."

If you succumb to this temptation, you will risk damage to the model trying to trim it with the wrong warp, and once you do remove the warps you will have to retrim the model.

DON'T waste your time trying to trim a warped model!

Wing Incidence Generally, this is set when building the model. It is easiest to think of wing incidence in relation to the centerline of the motor tube.

Incidence usually ranges from 0° (bottom of wing parallel to the motor tube centerline) to 2°-3° (leading edge of wing about 1/8" -1/4" higher than the trailing edge).

Once the model has been completed with the CG and wing incidence set, then trimming is done by adjusting stab incidence and tilt, rudder and thrust angles.

Occasionally, it may be necessary to change the wing incidence, but it is generally best to leave it alone unless the model can't be trimmed any other way.

Stab Tilt Stab tilt is often used to aid the glide turn. The advantage to using it rather than rudder deflection is that stab tilt is relatively independent of angle of attack and speed.

In other words, it has little effect on the power/climb phase. In the glide, if the model is upset and picks up speed or dives, stab tilt will not accentuate the dive or spiral turn. A general rule of thumb is to have the side of the stab in the direction of the turn about 1/4" to 1/2" higher than the opposite side (when looking at the model from the front).

As with wing incidence, it is best to incorporate stab tilt when building the model.

Changing the stab tilt after the model is completed will normally mean adding shims under the stab leading edge on one side of the stab platform. This will also change the stab incidence, which will then have to be compensated for by raising the stab trailing edge.

Hand Gliding Now that you have established the CG, warps (if any), wing incidence and stab tilt, you can finally take the model out for hand (not hang) gliding. Assemble the model and install a motor. Be sure there is

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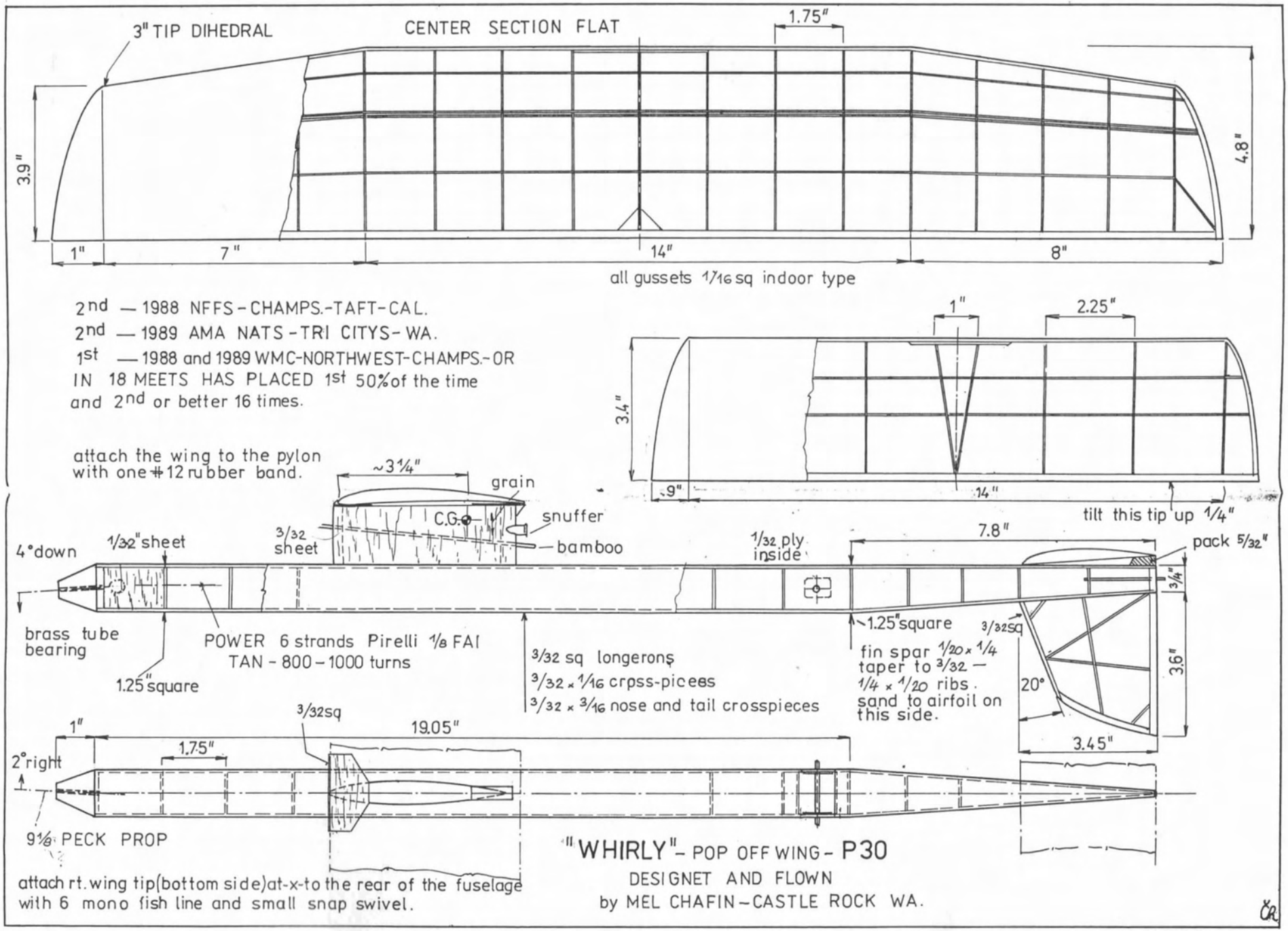

"WHIRLY" - POP OFF WING - P30

DESIGNET AND FLOWN
by MEL CHAFIN - CASTLE ROCK WA.

enough slack to allow the prop to freewheel. If the prop does not freewheel, you will not be able to adjust the model for a consistent glide.

A freewheeling prop creates a lot of drag, and you may be wondering if it might be better to use a prop stop of some sort. Well, the aerodynamicists tell us that a free-wheeling prop has less drag than a stationary one.

Wait for a calm day before you try to trim the model. If you fly a new model on a windy day, it will be difficult to figure out what the model is doing by itself versus what the wind is doing to the model. So be patient. On occasion, I have had to wait months before the weather was nice enough to trim a new model.

Although it is true that eventually, you will have to make contest flights in windy weather, it is still better to trim the model in calm conditions, then work with the adjustments necessary when flying in wind an turbulence.

Hold the model at eye level, right wing slightly lower (we're assuming that the model is being adjusted for a right glide). Jog forward to start the prop turning and let the model "fly" out of your hand. Observe the glide. If the model stalls, lower the stab trailing edge. If the model dives, raise the stab trailing edge.

I prefer to start out with a balsa shim glued to the fuselage under the stab trailing edge that I know will be too much. It is easier to remove pieces of the shim with a razor then add to it. If you start out with insufficient decalage, then you will have to carry bits of shim material to add under the stab trailing edge. This is a nuisance, and if you don't glue the shims, you will have to replace them after each flight or when the model DTs.

An alternative to fixed shims is to use a small machine screw attach-ed to the fuselage under the stab trailing edge or protruding through the bottom of the stab trailing edge. The screw is then used to adjust the stab incidence.

Glide the model several times, observing the glide. If the model glides straight ahead or to the left, you may need to increase the stab tilt or add a small tab to the rudder. (A piece of balsa 1" x 1/4" angled 10^0-20^0 to the right should be sufficient.)

My experience has been that a model usually needs a combination of stab tilt and rudder offset or tab for a consistent glide. If you do use a rudder tab, go easy, since rudder adjust-

ICER - P-30

By Bob Lipori, The Sky-Scrapers MAC

After eight winning seasons with this highly competitive model, Bob has come up with an innovative theory on how to improve it. Early tests confirm it.
--Bob Hatschek, Flyoff editor, Spring 1988 issue

The Icer P-30 has been one of my most successful designs to date. It's easy to fly, usually taking one or two flights to trim, and its performance is above average, having won more meets over the past eight years that I can remember. But it always had one fault, and the interim cure for that led to another fault.

In gusty weather or violent thermals, the left-gliding model had a tendency to spin to the ground like a hand-launched glider. The temporary fix was to move the CG forward to 65% and carry a bit more incidence. This helped the glide, but made the climb rather loopy. I always felt the model could climb much higher with a more rearward CG position.

It took a long time to realize why the spin tendency occurred, since none of my other ships with folding props had this fault. It finally dawned on me that the free-wheeling was the cause!

In the climb phase, propwash on a top rudder creates a left-turning force. With a free-wheeler, however, this propwash effect continues into the glide. And it gets stronger as gusts spin the prop faster. With the small, high-revving plastic prop the effect is stronger than with larger-diameter props because a higher percentage of the disk area is striking the rudder.

This is what was causing the spin on my left-gliding P-30s. I've never tried it, but it follows that a right-gliding P-30 would tend to straighten its glide turn under the same weather conditions and fly out of lift or start to stall.

Putting some of the rudder area below the centerline would help, but was rejected for the Icer P-30 because of potential break-age problems in landing on hard runways.

Twin rudders proved to be the ideal solution because it was now possible to more the CG back to 70% and reduce the incidence with a resulting climb that is much higher! The new setup requires only 2° right thrust, as opposed to 5° on the single-rudder version. This seems to indicate that the left propwash effect has been substantially reduced.

More testing will have to be done in gusty weather conditions to prove the validity of the theory, but early tests look promising.

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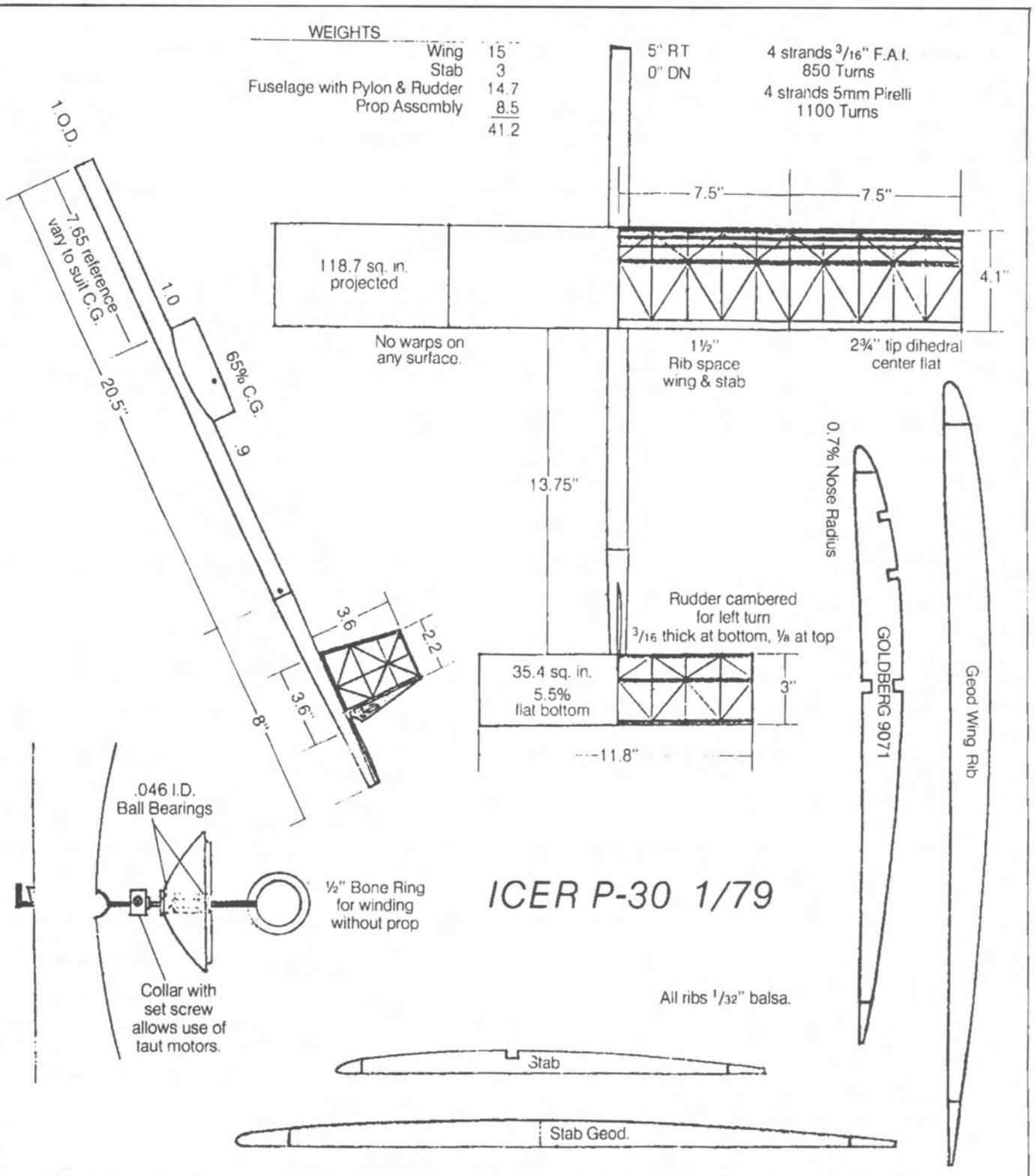

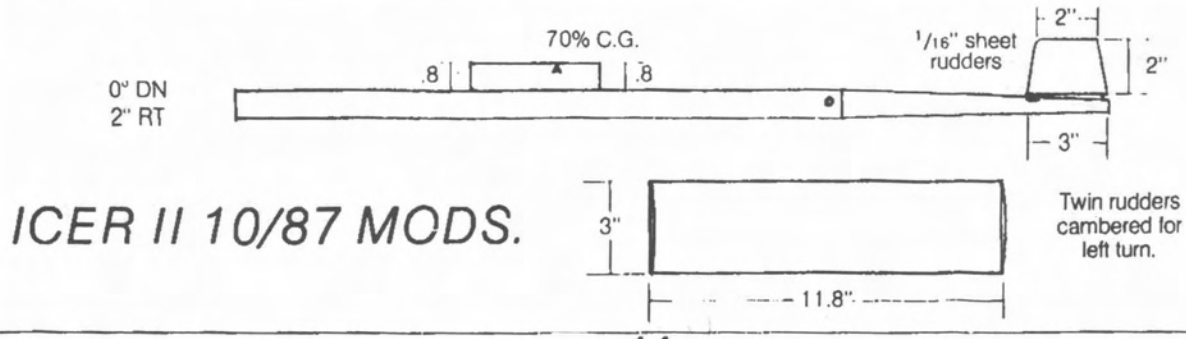

ICER II 10/87 MODS.

ments are speed sensitive and will show up both under power and in the glide.

Sanding an airfoil shape into the fin may allow you to avoid using a tab. With an airfoil shaped fin, the curved side should be on the left for a right turn and vice versa.

Another alternative is to offset the entire fin slightly. This isn't as crazy as it sounds. A tab or an airfoil-shaped fin gives the fin camber, and this is what gives the fin its tendency to be more effective as the speed increases. A flat fin offset slightly will not be quite as speed dependent as a cambered fin. The trick is to use only a teeny bit of offset.

If you can do your hand gliding from a hill or off a ledge, you will be able to get pretty close to the actual glide trim. Hand gliding from eye level will not get the model quite as close to the true trim. Once you fly the model under power, you will almost always find that the model will have a slight stall, and the turn may be too wide. If so, reduce the decalage and add more stab tilt and/or rudder tab.

Powered Flight Now you are ready to add some power to the equation. Hand wind 50-100 turns and launch the model into the wind with the right wing banked slightly. The model should climb to the right in a smooth circle.

Because of the free-wheeling prop, it is often difficult to determine when the motor has unwound. Usually, the model will slow down as it starts to glide, and sometimes, the model will display a slight stall because when the motor unwinds, the model is not able to maintain the higher angle of attack at which it was flying when under power.

Observe the power pattern and the glide. If you were thorough when hand gliding the model, the glide should be pretty good. If the model stalls, lower the stab trailing edge in small increments. If the glide seems to be too wide, increase the stab tilt, or add a small amount of rudder tab.

Often, tightening the glide circle will eliminate a slight glide stall without having to change the stab incidence.

Thrust Adjustments: If the model climbs steeply under power for a few seconds then stalls (power stall), but glides okay, then you will need to make some thrust adjustments.

This is usually done by inserting shims between the nose block and the motor tube. Over the years, I have observed an amazing variety of materials being used for shims: index card stock, matchbook covers, paper and wooden matches, bits of balsa, spruce and plywood, pieces of grass, straw and twigs, etc.

Although I will admit to having used almost all of the above at one time or another, some are not really wise choices. Shims should be made of firm material. A piece of balsa may be crushed between the nose block and motor tube, and what you thought was a 1/16" adjustment may have been something less.

I prefer pieces of plywood and index card stock, and always keep scrap pieces of 1/64" and 1/32" plywood and index cards in my toolbox.

Remember also that shims are temporary. Eventually, it is best to either glue the shims in place or sand the front of the motor tube to the desired angle.

This means you should have a sanding block handy when trimming models. If you don't, you'll have to sand the angle at home, and it probably won't be quite right the next time you fly the model.

(Some larger rubber models use adjusting screws in the nose block or motor tube for thrust adjustments. This could be done in a P-30, but you'll have to be clever, because there isn't as much space and weight margin to work with.)

Generally, it is best to go slowly and methodically when trimming. Don't increase the number of turns until the model is climbing properly at a certain number of turns. Then increase turns by another 50-100.

In practice, you can increase the number of turns fairly rapidly when trimming a P-30 because they are so light that they don't seem to get into really dangerous situations, and even if they do hit the ground under power, they are slow enough that little, if any, damage is done (unless you are flying over concrete).

(another in the series)

Great Literary Selections

By Grant Carson

Indian Jones and the Absolutely Last Crusade

(As it might have been written by George Lucas)

Final Act, final scene: The cave of the Rubicons, Indiana and Gwendolyn stand before the golden idol with the ruby in the forehead, he, hardly ruffled after subduing the Rubicons with his whip, she with disheveled hair and torn khakis (especially around the breasts).

Gwendolyn, shouting: At last! The Ruby of Kayaam!

Indiana, sneeringly: Have the Ruby! It's yours! Behind the Ruby is the real treasure! The hieroglyphics told me. One must only turn the Ruby to reveal the secret compartment with the true treasure of the Rubicons! An O&R .19 in mint condition in the original box!!

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P-30 Trimming & Flying

Power Stall The most common problem encountered when trimming the power pattern is the power stall. This is usually controlled by a combination of right and down thrust.

There is no optimum combination since every model is different. Generally a process of trial and error is the only solution. Add right and down thrust until a nice spiral climb is achieved. Too much down thrust will cause the climb to flatten out in the cruise. Too much right thrust will cause the model to "chase its' tail" and in windy weather, it may be blown sideways and spiral into the ground.

One the other hand, a model which climbs almost straight up, hanging on the prop, looks impressive, but this may not be the most efficient climb. An FAI power model can climb vertically because the engine's thrust exceeds the model's weight. A low powered model like a P-30 climbs more efficiently on a combination of prop thrust and wing lift.

If the model requires a lot of down thrust to prevent power stalling and seems to have a flat cruise, this can sometimes be helped by moving the center of gravity back. This will allow the model to glide with less decalage, and the amount of a down thrust can be reduced. (This is where you'll wish you had an adjustable pylon.)

If the model climbs straight and steep but sometimes stalls and takes a long time to recover from the ensuing dive, moving the center of gravity forward and adding a little more down and right thrust may cure this.

When flying in windy weather, it should not be necessary to make any changes in thrust adjustments, but moving the center of gravity forward or dropping the stab trailing edge a bit (de-tuning the glide) helps the model to handle the turbulence.

Occasionally, someone will get away with a downwind launch, but this is not a good idea. The best approach to launching a model in strong winds (besides waiting for a lull) is to reduce the angle at which the model is launched and to keep the wings level.

Having said all this, here is one last bit of advice. If possible, get a more experienced modeler to help you trim the model. Often, someone watching from a different angle can make a better analysis of what the model is doing, allowing the proper adjustments to be made.

Although this was intended to be a P-30 trimming article, the procedures described can be used for trimming any outdoor rubber model, If you have any questions of comments, please feel free to write.

Chris Matsuno
8576 Ginger
St. John, Mo,
63114

Tip
by Terry Thorkildsen

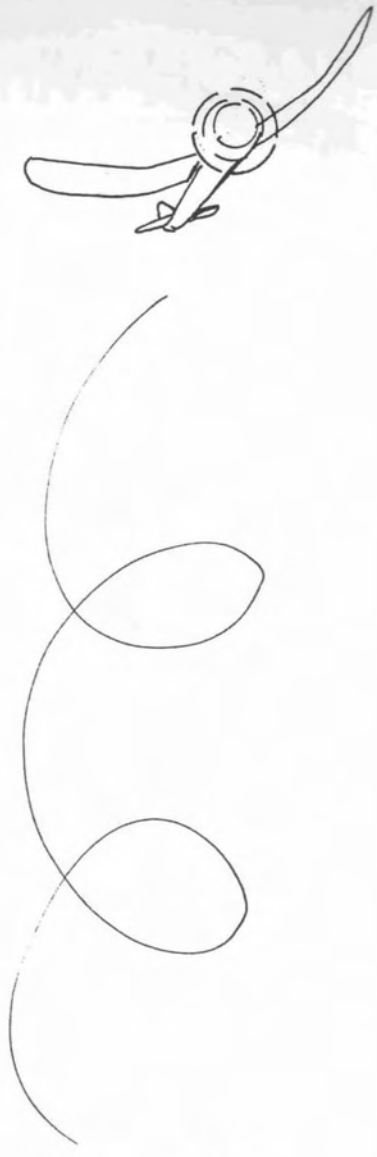
CA Glue

What do you do when your CA glue has been sitting around for a while and its getting too thick? If it is the thick type and you don't have too much left in the bottle, you can add some thin Hot Stuff to it to thin it out enough so that you can finish the bottle.

Bob Hunter from Satellite City, the makers of Hot Stuff, gave me this tip.

Don't forget to keep it in the freezer until you are ready to use it for the first time. It will increase its shelf life. But let it come up to room temperature before you open it.

A reminder that the next two issues of the *Digest* will cover two months, June & July and August & September.



Cartoon Art by Jerry Neal