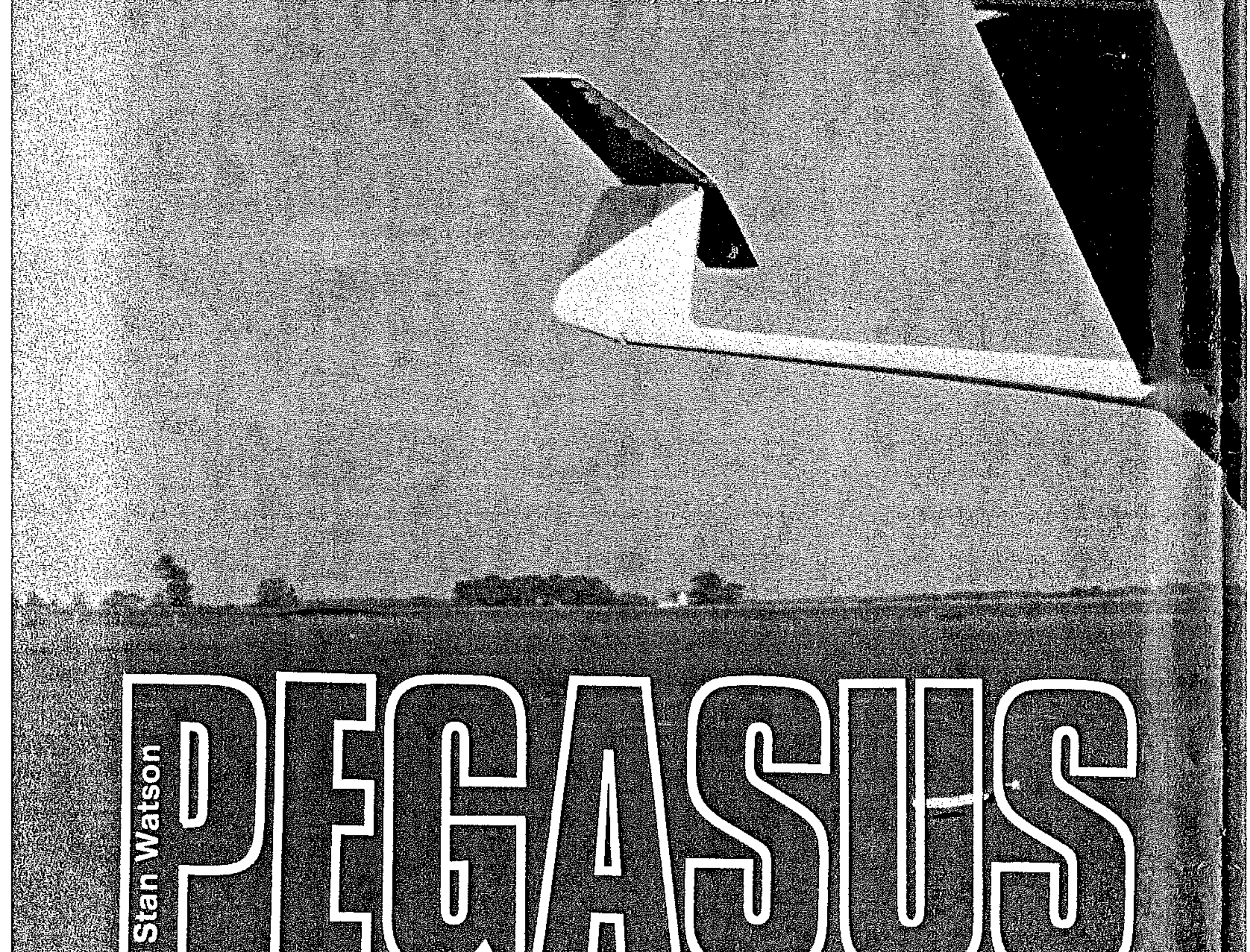
BIGGER is better! At least that's what they say. But for what? We've seen FAI RC soaring models getting smaller and smaller, year by year, and the most recent crop is clearly "better" at speed, distance and even duration. So, bigger is not necessarily better. What matters is the flier's objectives for any given design, as well as the rules for an event he may wish to enter. Finally, a person may wish to build a soaring model which will suit his own ideas of what is best, and let the "rules" be for those who wish to be bound by them.

The Pegasus began as a design concept which finally began to take shape in January, 1978. My objective was to seek higher L.S.F. requirements with an aircraft that would be capable of setting altitude, distance and duration records. I was also terribly impressed



Stan puts the big Pegasus right off the camera on this "see the birdie" pass. The big flaps are down—they "reflex" up to a negative angle for greater speeds. Ship weighs 160 ounces, but thermals well in light lift at the FAI limit of 176 ounces (11 pounds) if flown smoothly and accurately.

Stan Watson

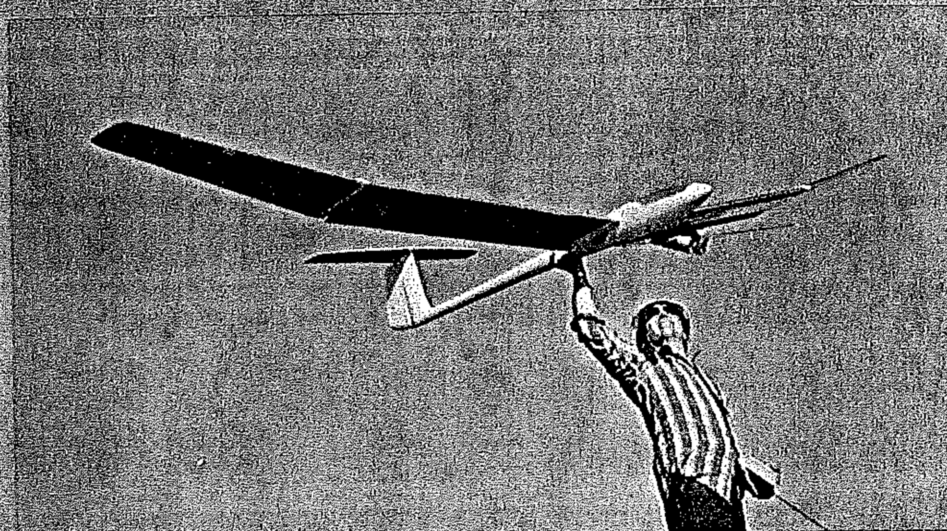
PEGASUS

If you think big is better, or simply wish to fly a superb flying machine, this 166-in. Unlimited Class design holds two records currently, and did hold the altitude record. Rest assured, they don't come any better.

by the sweep and beauty of the large models in flight, and couldn't wait until I could also fly one. I did want a model that would do well in contests, including spot landings, because I was really involved in L.S.F. achievement. And I wanted a fiberglass fuselage and bladed wings for simplicity, strength and rigidity. Pegasus first flew in May of 1978. The second model was improved with flaps, sheeting and a bit of "Phillips entry" cranked into the airfoil to improve high-speed characteristics.

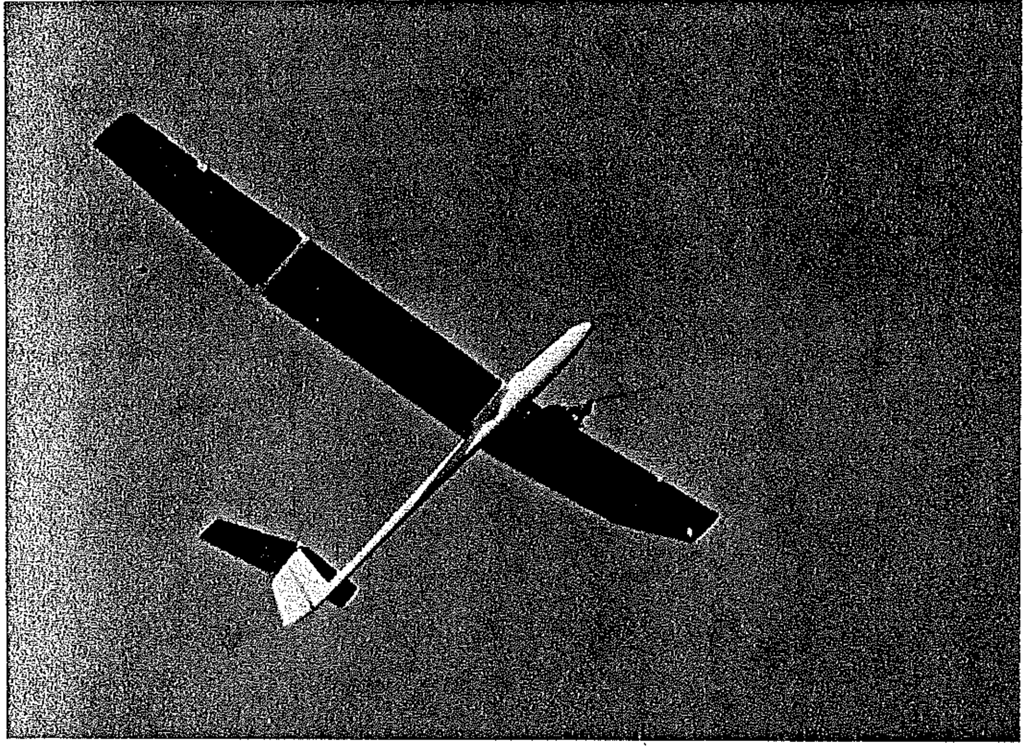
Pegasus, the mythological flying horse, is an appropriate name for a large, high-flying, load-carrying craft. Further modification will occur by those who wish to tailor the characteristics to suit their own needs, and who feel that they are familiar enough with large models to take the risks involved in making such changes.

One such modification I think would be to make the model more suited to fast, cross-country flight



Sensitively feeling the winch pull, Stan is caught split second before launching big bird on its way. Large spoilers are operated by an independent servo for safe descents from high lift, and flaps and spoilers are operated from one stick on transmitter with return springs removed (this stick) to allow positioning to remain hands off. Trip-strip turbulator is located at spanwise high point.

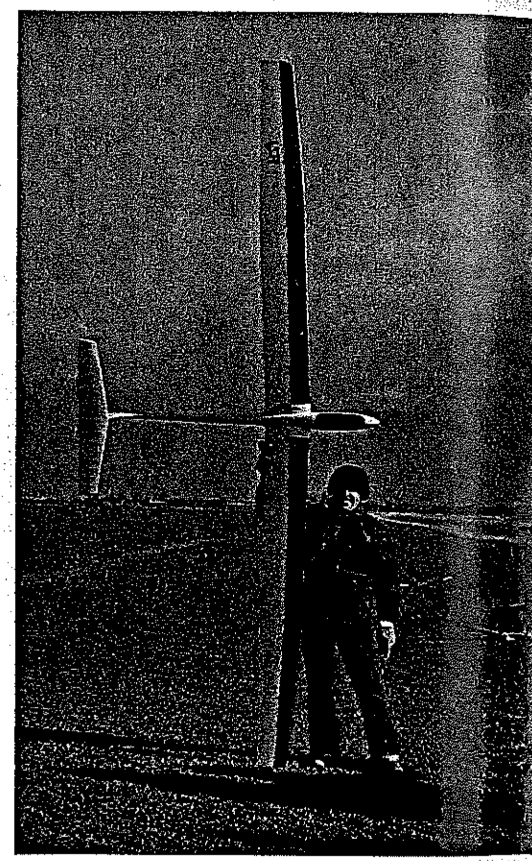
From terrain with limitless horizons, Pegasus is off into the infinity of the skies above. The CG on plans is as far back as you'd wish to try, but balance at the main wing joiner gives greatest stability when high altitude visibility becomes a problem. The rearward CG provides the best lift/drag and greatest airspeed.



If you have any sense of oneness with the air and a feeling for "flight" for its own sake, the sailplane is the supreme RC craft. Wheeling on silent wings, a white speck against the blue, it touches the soul. For the realistic sharp-eyed pilots among you, we'd guess you really are looking at the angle of the towline.

(but less for altitude flight). This would be to thin the wings toward the tips, one or two percent at the polyhedral break and another percent or two at the tip. "Stretching" the tip panels would enhance the scale-like flight appearance at the penalty of more difficult spot landings. The model as shown is rock steady and modifications, if carefully thought out, should not be too risky.

General Description: Pegasus is 166" span, 67" long, with 1675 sq. in. wing area, and is a T-tail design. The wings are in four separate panels, joined together by spring steel blades, and are fully sheeted except for a small portion of the underside of the tips. The center sections are equipped with generous flaps which may be "reflexed" (raised up) to a negative angle to give greater speeds. Large spoilers are operated from a separate servo to give safe descents from high lift, and the flaps and spoilers are operated independently from one control stick at the transmitter (the return springs are removed from this stick to allow the positioning to remain "hands off"). When built with medium-weight balsa and generous amounts of epoxy and alaphatic resin glues, the original model came out to a fully-assembled weight of 160 ounces. I believe that a lighter model would need more "Phillips" to penetrate well at weights in the 145 ounce range, and the lighter model wouldn't be quite as rugged. *Don't* skimp on the main wing spar if you decide to try for a lightweight. Actually, the model will thermal

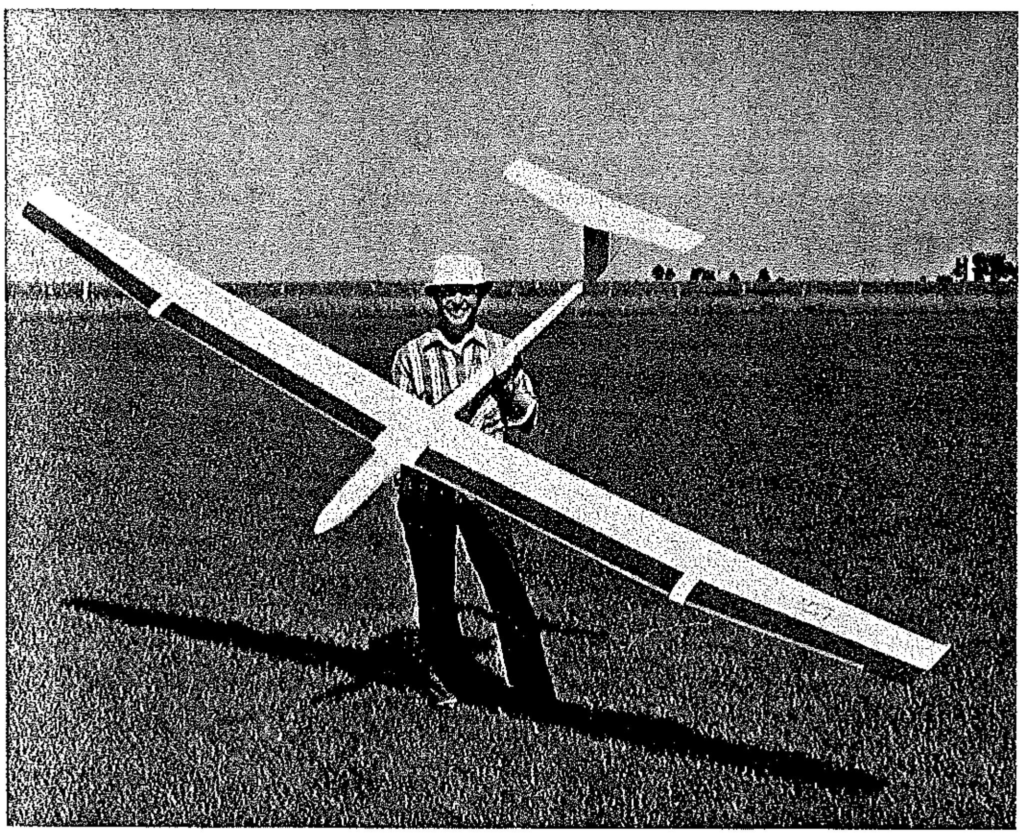


Wearing a woolly hat and scarf on chilly day, Stan poses Pegasus to give vivid impression of its configuration.

well in light lift at the FAI limit of 176 ounces (11 pounds), if flown accurately and smoothly.

Aerodynamics: The design approach was conservative, with a relatively thick wing section chosen for strength and stability "hands off." The leading edge is relatively sharp, but stalls aren't abrupt. Camber is about 4% and tip washout (¼") is used to help avoid tip stalling. A "trip strip" or turbulator is located span-wise at the high-point (about 38%). This strip is simply automotive ⅛" trim tape.

Wind tunnel tests on the airfoil by Emil Martinek, a S.O.A.R. member, confirms the high lift, low drag, wide speed range of the flapped section. The turbulator strip appeared to help (I have not



We'd smile, too, if we had a bird like this, created to further Stan's quest for higher LSF requirements with an aircraft capable of setting altitude, distance, and duration records. For the experienced, he discusses possible variations.

Editor's Note: We are grateful to have the opportunity to publish this excellent design and a truly outstanding article. Anyone interested in RC flying will find it absorbing reading—even if sailplanes are not your dish. If that's the case, skip the construction, but be sure to read the phenomenal conclusion on flying techniques for a rare insight into the world of super soaring.

yet tried the model without it). The tail surfaces are relatively thick and give good tail volume and provide lots of stability and control with only slight penalty in drag. A smaller, thinner horizontal stabilizer would be the choice of the modeler interested in all-out cross-country flight.

The CG as shown on the plans is probably as far to the rear as you may wish to try, and a balance point at the main wing joiner will give the greatest stability at highest altitudes when visibility becomes a problem. The rearward CG will give best L/D and greatest speed.

Any wind noise may be isolated and eliminated by sealing noisy gaps with celluloid strips (½" x .020") attached with cyanoacrylate glue to the leading edge of each gap, overlapping the rear edges and allowing free movement. I use such strips on spoilers, flaps and rudder and as a result the model is almost totally quiet in high-speed flight. I think that these strips could be covered with low-temperature films to match covering colors. However, you may discover that careful workmanship will yield a model that is quiet without any such fixes. Regardless, the wing joint to the fuselage is sealed with plastic tape for structural as well as aerodynamic reasons, and the wing tips and horizontal stabilizer are also taped for assembly. I use 4-mil plastic tape in bulk for this purpose, matching colors for a pleasing appearance.

The T-tail configuration is familiar to full-scale soaring fans, now that almost every modern 15-meter design is equipped with one. This design yields a more effective rudder action and has the practical advantage of being up and out of the way in off-field landings. The model's long tail moment arm gives arrow-straight launches and a relatively quick response when turns are made. And if you should happen to do a ground loop when landing and the model flips over (I hate to admit that this has occurred a few times) the strong fin protects the rudder from damage that usually would occur with a conventionally configured craft.

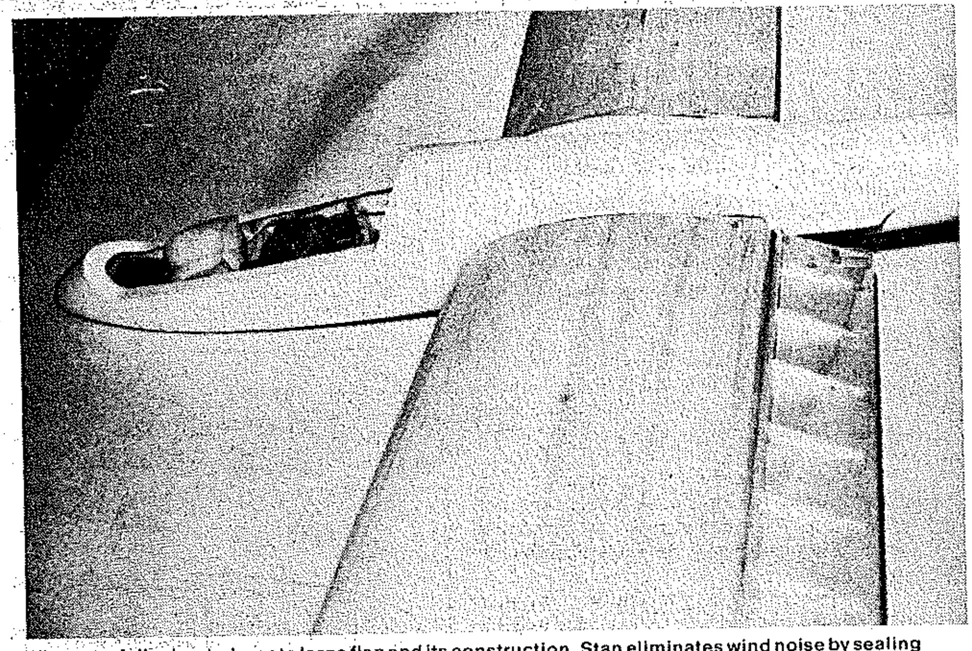
Performance Record: With the first Pegasus I flew to L.S.F. Level IV and qualified for the L.S.F. International Tournament, 1979. In that contest it placed 12th overall, combined duration and speed, out of 92 contestants. It was 5th in overall duration, and 4th in Unlimited duration at that contest. The longest distance flight so far with the Pegasus was the 14-mile attempt in the Great Race IV. The model has accomplished thermal duration flights of two hours plus, once for over three hours. It now holds the National Soaring Open Unlimited records of 6.8 miles Undeclared Distance (9/3/79), Duration and Thermal Duration of 2 hours, 7 minutes, 41 seconds, and held the Altitude record briefly of 2200 feet.

Construction

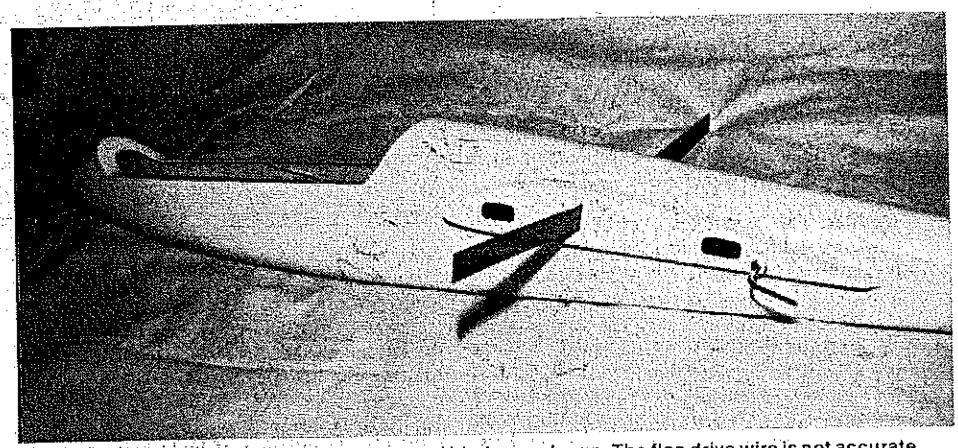
Since this model is not for the beginner I will not detail construction. However, a few points bear watching:

Wing: Construction of the wing spar should be accurate and without flaw. I construct the spar as a box, installing wing blade joiner boxes before closing the spar box. The blade boxes are tack glued, then epoxied when position is correct. The completed center section box spar is then glued down onto the lower sheeting, which is shimmed up to assure "Phillips entry." You should assemble both spars at once, using a single wing blade to join both wing blade boxes to assure their mutual alignment during this critical step.

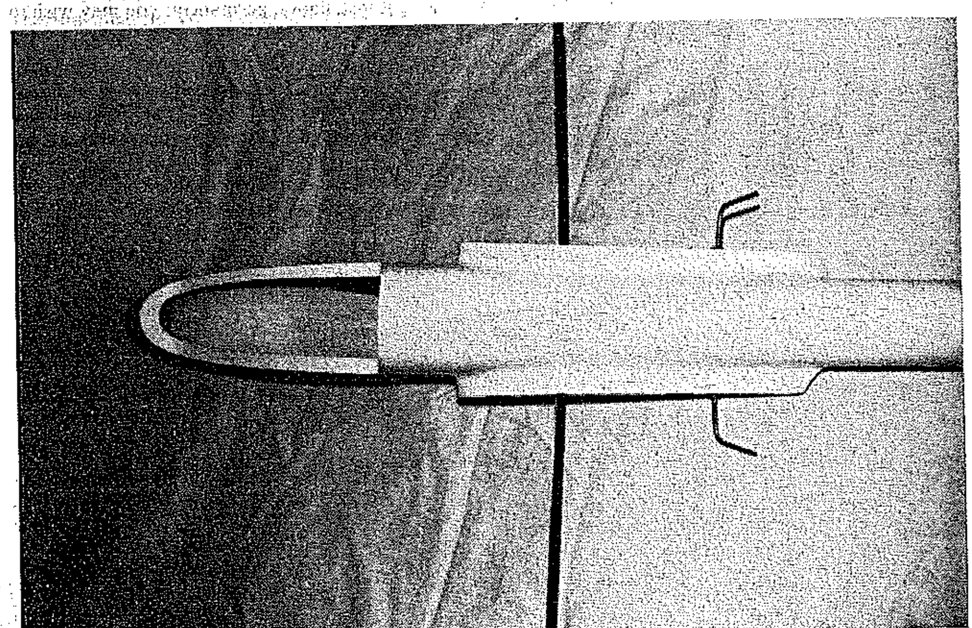
Tip assembly is conventional, with the ribs stack-sanded, and the tip blade boxes installed



Wings are fully sheeted—note large flap and its construction. Stan eliminates wind noise by sealing noisy gaps with celluloid strips attached with cyanoacrylate glue to the leading edge of each gap, overlapping rear edges and allowing free movement. Wind-tunnel tests confirm the high lift, low drag, and wide speed range of the flapped section. Text discusses lightweight version.



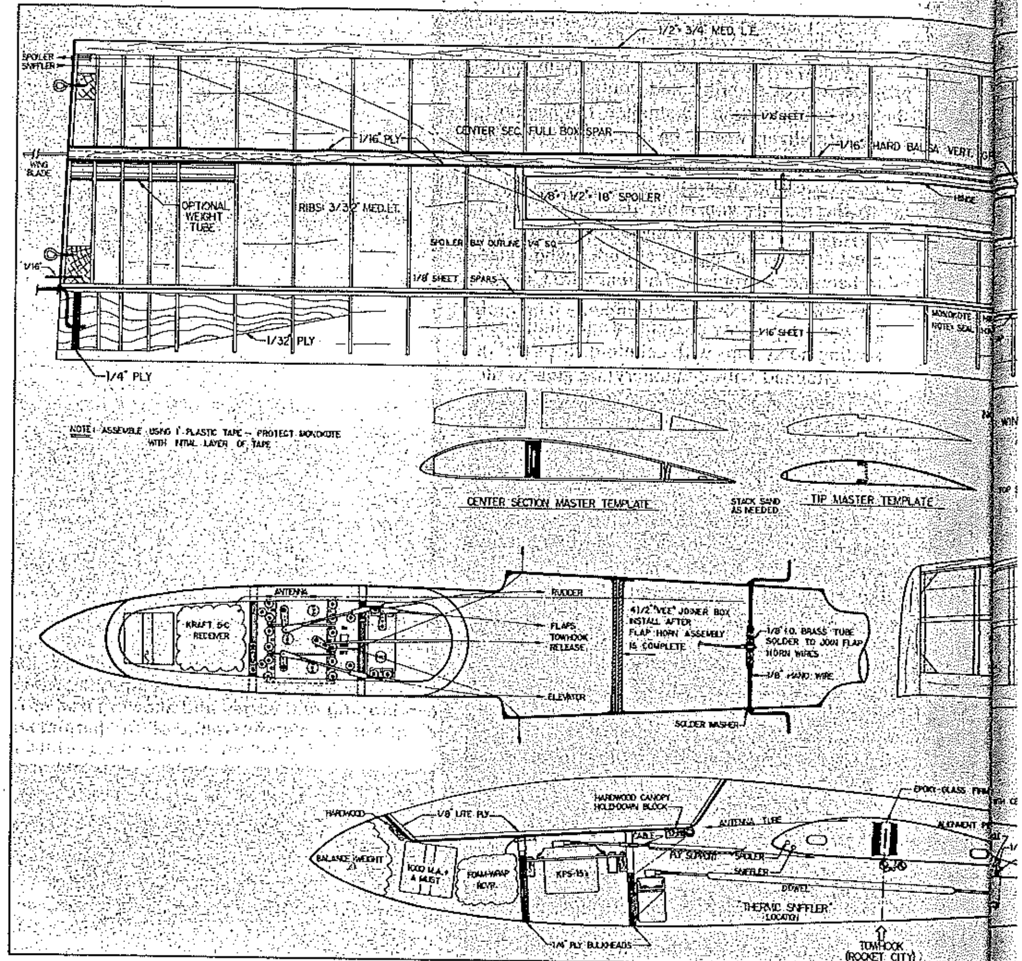
The wing is made in four panels joined by steel blades as shown. The flap drive wire is not accurate as shown—point is to note strength of those blades.



Since this model is not for the beginner, we advise the advanced people that this glass fuselage, main wing blades, wing blade boxes, fuselage blade box, canopy and control cables are available from the author. Wing is MonoKoted, black or dark blue underneath for visibility. The flap hinge line is completely sealed with clear plastic tape to leave the underside smooth.

while setting the tip polyhedral angle. You may find that using 5-minute epoxy to "tack" the blade boxes in place while setting the angle will eliminate the possibility of making a major error at this point. Make certain that you build in the ¼" tip washout while gluing the top sheet. Covering is with MonoKote, preferably with black or dark blue on the underside to help with visibility.

The flaps are hinged according to builder preference: MonoKote, fabric, plastic, etc. The important point is to seal the hinge line completely and to leave the underside of the wing smooth: I used clear plastic tape.



Fuselage: The fuselage is available from the author, as are the main wing blades, wing blade boxes, fuselage blade box, canopy and control cables. The fuselage is epoxy-glass, making assembly and repair relatively easy. The fuselage is supplied with control cable tubes already installed, eliminating the most tedious aspect of construction. Flap hardware is assembled and soldered in place before the wing blade box is epoxied.

Adjustments in flap angle can be made after complete assembly, if you can manage to get a thin soldering iron into the fuselage past the wing blade box.

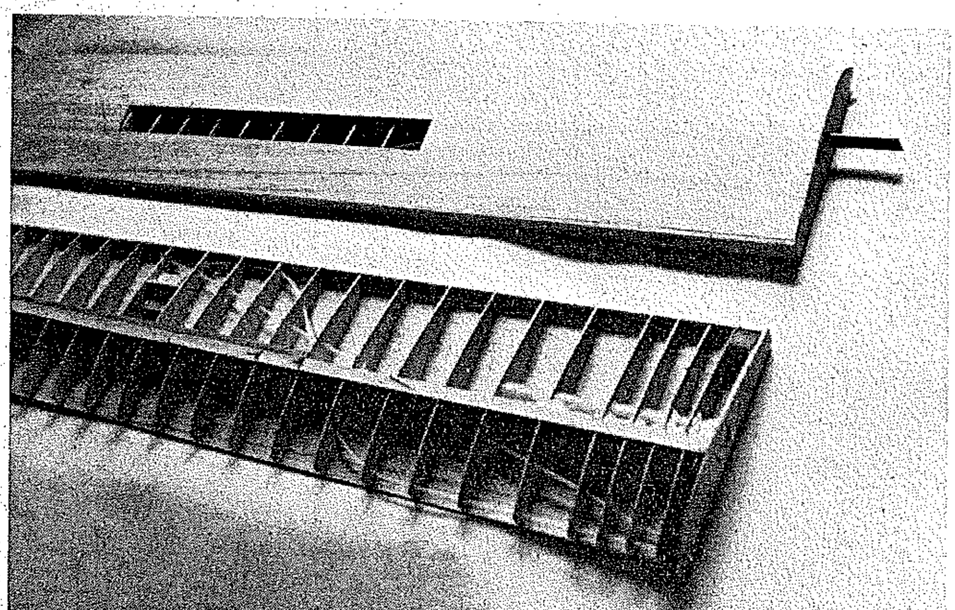
Stabilizer: The strength of this component should not be compromised in the search for light weight. The model will experience high aerodynamic and landing loads, so keep strength high. Construction alternatives are indicated on the plans: the original model used "bent strip" construction, but you may prefer conventional ribs and capstrips. Total weight should be about five ounces, with joiner wires.

Rudder: This part takes a lot of abuse during landings, so I recommend a strong hinge. I show hinge tubes epoxied and glass taped in place, a hinge that has never failed to hold.

Alignment: Mount the stab perpendicular to the fin after drilling a hole for the ⅛" I.D. brass mounting tube. Epoxy the tube in place, then solder retaining washers to the side of the fin. Finish with additional epoxy over these washers, assuring proper alignment to the fin and wing center sections with the wing blade box "tack" glued in place with 5-minute epoxy (roughen surfaces of the fuselage with sandpaper before gluing). Suspend the model between the backs of two chairs and sight from all views until satisfied that all angles are true, then complete the reinforcement of the wing blade box.

Radio Installation: I use large, rugged servos: KPS-15s. Installation of bulkheads should be sturdy (glass tape and epoxy). Don't make nose weight installation permanent: you may wish to use extra-large battery packs for long flights, installed in the canopy, and weight should be removed from the nose to keep the balance point as shown. The flap is on the throttle stick, and the spoiler is connected to that same stick, with the spring removed to allow in-flight settings to remain "hands off."

Finish: I recommend a white lacquer finish on the fuselage to reflect heat and to keep the tail boom as light in weight as possible. The underside of the wing and stab should be as dark as possible for good visibility under a variety of conditions. The leading edge of the wing is wrapped with reflective chrome mylar tape to give additional visibility cues at the limit of sight.



Panel at bottom is not yet top-sheeted, revealing pushrod runs. Sheeted panel at top shows the opening for the large spoiler. A long tail-moment arm gives arrow-straight launches and relatively quick responses when turns are made.

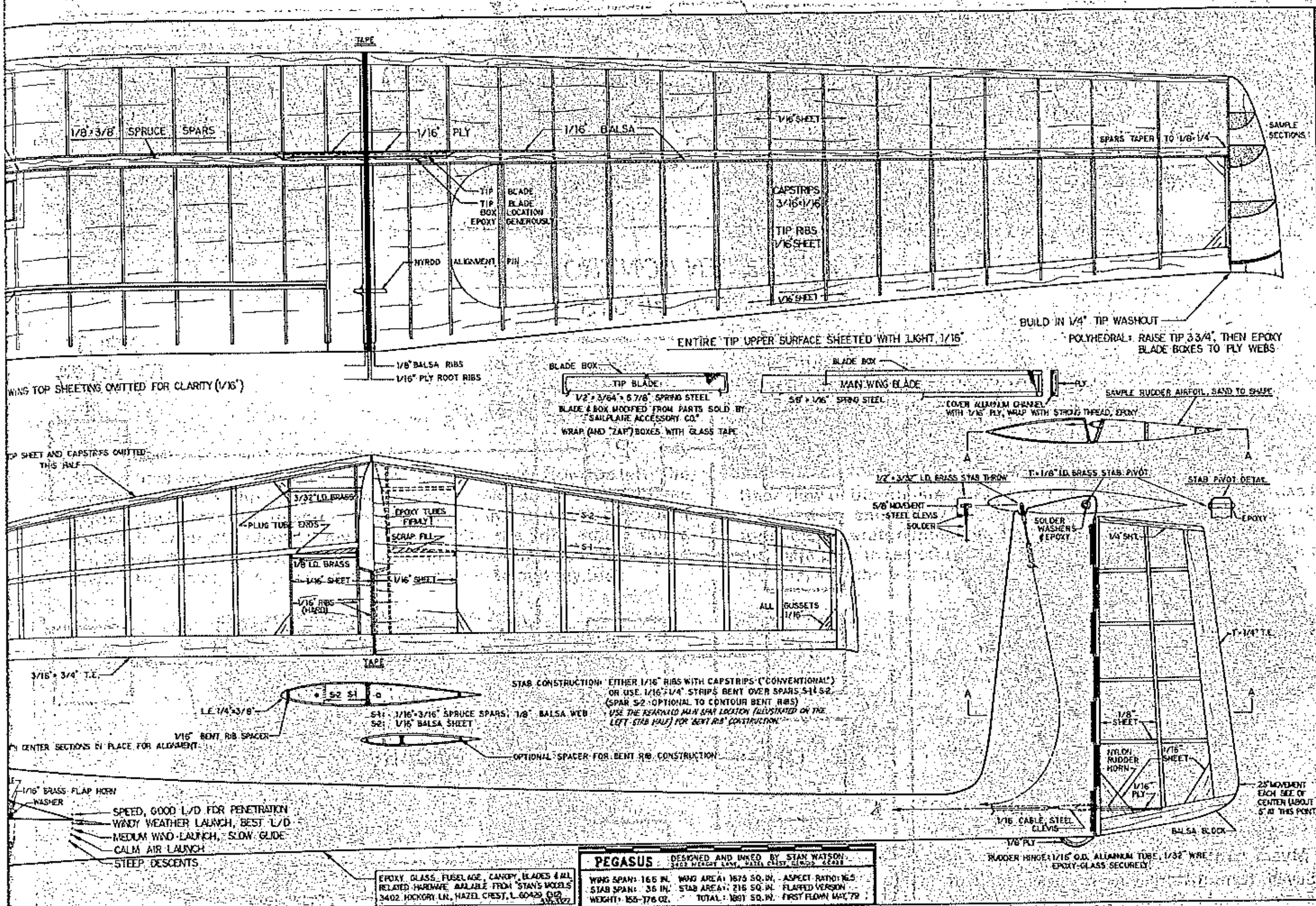
Accessories: The Thermal Sniffler, available from Don Clark at P. O. Box 117, Kensington, MD 20795, is a virtual necessity when attempting cross-country, altitude and duration flights. This is also a big help in assuring "maxes" during contests. Installation within the fuselage near the CG is recommended.

You may also wish to experiment with various barographs for altitude measurement. Replogle barographs are excellent, but bulky. I use the altimeter/barometer that appeared in the Jan. 1976 issue of *Model Aviation.*

Heavy-duty battery packs may be assembled from alkaline "D" cells and will fit into a special canopy for that purpose. The total pack will weigh about 20 oz., and nose weight should be removed to keep balance at the appropriate point. This pack will allow 8-hour and extended cross-country flights to be made with complete confidence.

Flight Instructions: The first launch and flight of a model of this size and investment can be

FULL-SIZE PLANS AVAILABLE . . SEE PAGE 128



quite exciting. I would recommend that you seek out an experienced large-glider flier to help you with the first launch. Use a strong, reliable tow-hook (I use Rocket City, and the Airtronix will also hold up) and also be certain that your towline will hold up under a "pull test" before you take that first flight. I recommend 130-140 lb. test line as best, but 100 lb. will also hold up if it is new and unfrayed (although back-stick pressure in mid-launch will almost certainly break it).

Use about 15 to 20 degrees of flap in low wind, less flap if the wind is blowing (see plans). Pre-load the winch line to about twice the tension that you would use with a 100-incher, then smoothly throw the model as the winch tension continues to build and pulse as the model "rotates" into climb attitude. The model will track straight and true, but if you get off to one side, steer back with rudder, or use forward (down) stick if you have a real problem on your hands (as might happen if you try to launch with lots of flap in high wind and you have thrown the model "up," not "out"). If you do break the line during the first few feet of launch, you may choose to loop the model out of it and land normally.

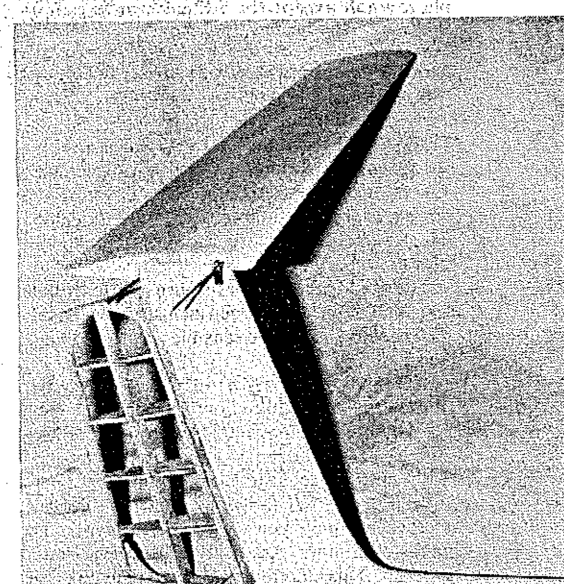
Near the top of the launch you should reduce flap, build speed, then release the line and climb forward and over the top. Keep the flaps in the neutral range and experiment with control trims to get straight flight, and when this is attained you may search for lift and altitude. Before you land you should try the full range of turns and banks, with and without spoiler, to prepare for landings.

In your first few flights you may feel as if you need the entire field to land, and in truth you may. Land straight ahead, once you have set up your approach. Slow the model with flap and spoilers in calm air, but use less flap if the wind is higher. Spot landings during contests are entirely within reason, and 80+ scores are common once the handling characteristics become familiar. This kind of flying may lead to some stress cracks around the rear canopy opening, but extra reinforcing with glass tape and epoxy will give the added strength you will need to minimize the effects of this abuse (you won't see the full-size glider pilots landing their planes the way we do).

Thermal Search: You should rely on observing other planes in the launch area and on your thermal sensor, as well as your perceptions of the air flowing past you as you wait to launch. Sudden changes in air temperature, calming or wind direction changes, insects and birds flying over are all good indicators of lift passing overhead. Many of the best fliers manage to launch directly into this kind of lift ("sandbagging," it's called). Turn immediately after launch height is attained and you should be able to climb as the bubble breaks loose and rises.

Alternately, if you don't catch lift right off the top of the launch, you may search upwind on 45-degree angles to the launch line and wait for that telltale rise, or deflection away from strong lift. Circle around and enter the core, keeping the flaps in the center range (down-flap will lead to snap-stalls if sudden, strong lift is encountered). Cruising and thermaling with neutral and even reflexed flap will enable you to search larger areas of the field than with down-flap. However, a slight amount of down-flap may give you the ability to slow down and float within light lift encountered in calm air such as in the early morning or around sunset.

Altitude Gain: This is the key to long-distance and long-duration, as well as, of course, altitude. The key to maximizing altitude gain is to center



Half of the T-tail stab in place, showing joiner wires. Fuselage finished in white lacquer to reflect heat, keep tail boom light. Wing L.E. wrapped with reflective chrome Mylar tape for additional visibility at sight limit.

within the strongest portion of the lift, then to smoothly circle within this area while maintaining enough back trim and stick to assure maximum rate of climb. The thermal sniffler really helps in determining the amount of up-stick that will yield

Continued on page 103

Several radios of interest to the helicopter flier were on display. Futaba showed their own 5JH, which has all the state-of-the-art features. Airtronics is now on their own and into radios. Airtronics radios, manufactured by Sanwa, have interesting features as well as economy prices. The standard Airtronics 4- and 6-channel transmitters feature exponential throw rates, servo reversing and a wide range of servo choice. Airtronics is also importing the Sanwa Custom Series radios. The helicopter radio features dual rate on elevator, aileron, tail rotor, throttle, tail rotor mixing, and a digital stopwatch.

The helicopter showing in the static competition was very sparse this year. Nontheless, the two models entered were of the highest caliber. A Hirobo .60-size UH-1E Iroquois won top honors. This attractive helicopter was finished in standard Marine markings. The second place helicopter was a D.C. Labs Bell 222 finished in the blue prototype colors. Both machines were very nice.

The outside demonstrations were very exciting this year. Each show attracted an audience of over 2,000 people. American RC had 13-year-old Curtis Crocker demonstrating both the Revolution 1 and Commander. John Simone demonstrated the aerobatic capabilities of the Commander as well as flying under the bridge for the third year in a row. Heli-Center West had John Gorham demonstrating the Cricket as well as helicopter aerobatics with his Heliboy. Richard Keppel flew both his Helibaby and Heliboy. Larry Jolly flew his Schluter Bolkow BO 105 finished in German military colors.

Last, and certainly the most exciting, Ernie Huber flew his Kavan Jet Ranger. Ernie has always been right at the front as helicopters have progressed. This year he certainly floored the crowd as he nonchalantly turned his Jet Ranger inverted and flew all over the lagoon. Quite a show, Ernie. . . we all enjoyed it, and hope you come back next year. And speaking of next year, why don't you come out and visit us? The MAC Show is usually the last week in April or the first week in May. The weather is great, the flying exciting. Come on out and join us; we can do what we like best—talk and fly RC model helicopters!

Pegasus/Watson

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this rate.

You should widen your circle as you rise, assuring that you are in the strongest lift without losing altitude due to banking at steep angles. Should very tight turns be necessary you may prefer to use a slight amount of down-flap. Always remember to keep the flying speed up, as this aircraft is most efficient at higher speeds than you may be used to.

Once you are as high as you wish, leave the thermal and return upwind using reflex or neutral flap to clear down-drafts. You may find that you prefer this fast cruise, once you learn to recognize lift when encountered.

Cross-Country Flight: As long as you have enough altitude you may convert this to speed. "Enough" altitude in this case means enough to transit from thermal to thermal with enough left over for a margin of safety. Remove the frequency flag from your transmitter antenna, find a comfortable position in an open truck, convertible, van or car, and proceed as safely as possible along country roads, pausing to work lift as necessary. Here is where the ability to reflex your flaps and move out will really pay off.

As your speed builds up you should be able to use more down-trim without losing altitude. Pilots call this "getting up on the step" and it takes a bit of experimentation to find the right combination of CG and flap angle to find it. Believe me, you'll know it when you do! The model will become especially responsive to rudder, will double its apparent speed, and will seem not to lose altitude at all. Of course, you will, and sooner or later you'll come to the realization that you'll have to work some lift again.

However, in some conditions you'll be able to cover mile after mile merely by slowing a bit and climbing while in lift, then beginning your dash again. It's *this* kind of flying that will have you saying, "This is what soaring is all about!"

Altitude Flight: You should have a thermal sensor to aid not only in altitude gain but in finding a safe rate of descent once you wish to come down. You will find that the model is most visible under the white clouds (cumulus) that signal the best lift. Keep the model as directly overhead as possible, for visibility. Have several helpers keeping watch on the model, with the realization that this is the type of flight that offers the most risk. Having binoculars ready and focused is a good idea.

Aviation weather forecasts are useful in spotting days when the cloud base will be high enough for your purposes. You will find that your estimates and the actual altitude gained can sometimes be not at all in agreement. The actual altitude gained can often be lower than estimated because the model has drifted downwind, or there is haze present, or you have been flying in "blue sky." However, you should easily be able to fly above

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3,000 feet and with care into the 4,000-ft. range. The present AMA altitude record is 3,400 feet in Unlimited, held by Jack Hiner, and the World (FAI) altitude record is 4,988 feet.

One of the S.O.A.R club members, John Dineen, is the present holder of the AMA National record in 2-meter with a flight of 2,050 feet, so you see what could be accomplished by a model of the size of Pegasus. Remember, according to FAI rules the total all-up weight of the model cannot exceed 11 pounds. You may find (as does Jack Hiner) that launching with the "Noon Balloon" and climbing with the cloud bases as the afternoon progresses is the best way to get to really high altitudes. Locating the CG at the main wing blade is the safest, most stable position for altitude flight.

Conclusion: Much of the preceding can be applied to all soaring models, but I have found that the advice will apply especially to large models that are best suited to flying high and far. My thanks go to Jack Hiner for his advice in flying the model, and to John Dineen in his help with laying up the original fuselage, and to other S.O.A.R. members in their cooperation and support. Last, and of course not least, my appreciation must go to both my wife and mother, who have over the years put up with a lot of the mess and bother associated with this hobby and yet are still capable of showing enthusiasm when a new project takes to the sky.

RC Technique/Myers

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point for the battery voltage and modulation signal. It's wired so that everything switches to the RF board in use. We wondered if the antenna would be substantially supported in this situation, but don't give it another thought. You could use it

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