





PARAGON

A 118 inch span sailplane that is easy enough to fly for the pure novice, yet highly competitive for the veteran flyer. With a 6.4 ounce wing loading, the Paragon is one of the lightest Open Class machines around, but penetrates like a much heavier ship. The ballast compartment can hold over three pounds of weight. If this isn't enough, it's ideal for night flying with chemical lights.

By Ed Slobod.

Sailplane flyers, are you getting tired of the same old thing each time you go out to fly?

Would you like to fly at night for a change of pace?

No, I'm not crazy — free-flight people have been doing it for years here in California (they **really** are crazy). But flying sailplanes at night is not insane, just different. And that isn't the only reason to try night flying. It is an excellent way to find out how your sailplane compares under relatively uniform conditions to other sailplanes. And, a number of people can fly the same sailplane to see who is the better pilot.

Assuming that you do it in the Summer months, you will find the air to be warm and still and there will be thermals. Not "trash movers," of course, but enough to give flights of from 5 to 8 minutes from a Hi-Start. You will soon discover that some sailplanes are better than others for night

flying. We have found that a good sailplane for night flying should be able to make full use of the Hi-Start for maximum altitude, have a light wing loading for minimum sink, and be "hands-off" stable, especially around the pitch axis. Since the lights are usually attached to the wing tips or the wing polyhedral joint, it is relatively easy to see rolling or turning, but pitch instability can give you the cold sweats even on a warm night. Details about night flying and how to do it follow the section on adjusting, trimming, and flying.

I must confess, at this time, that the model being presented was not designed primarily for night flying. As it turned out, however, there are few, if any, changes I would make if I were to start from scratch with maximum performance for a night flying sailplane as a goal.

As a manufacturer of several sailplane kits, I had more than a casual interest in what the contest and sport flyer wanted in

the way of a sailplane kit. I had concluded that from a performance standpoint, the majority wanted high launch capability, light wing loading for minimum sink, the ability to climb in light lift, good handling, small circle capability, slow flight for more precise spot landings, and provision for easy ballast addition for penetration and speed runs when needed. In anticipation of future wider use of Thermal Sensors, a place for the sensor should also be provided.

The prototype model designed to the above requirements was completed, by coincidence, the day of a scheduled night flying session and while I did not intend to put it up in the dark, I thought some testing could be done at twilight. One hand glide verified C.G. position and the next flight was on the Hi-Start. Several more flights followed with the model averaging about 5 minutes per flight. As darkness fell, I would have been content to stop flying right there, but was persuaded by my flying buddies to

put two chemical lights on and give it a try. A number of flights followed with different pilots, the best of which was for 7 minutes 45 seconds by Jerry Krainock. Since that time a number of night sessions have been held and the Paragon has yet to be out-performed.

For those of you who prefer to fly during the daylight hours, you might be interested to know that the same model was hand-launched by Bill Nibley at Pierce College on September 7, 1975, for a thermal flight of 73 minutes 13 seconds, and was brought down because of concern about the condition of the internal batteries.

CONSTRUCTION

Clean off your workbench and put fresh sandpaper on those sanding blocks. Regardless of which component you choose to assemble first, I would advise cutting out all the parts for the entire model before beginning assembly. You can trace the parts on tracing paper to make patterns which are then cut out and rubber cemented to the parts to be cut out or you can get two sets of plans and use one set for the patterns which are cut directly from the plans. Parts that are similar, such as main panel ribs, can be cut in stacks using one template. After all the parts are cut out and all other necessary material obtained, assembly can be started.

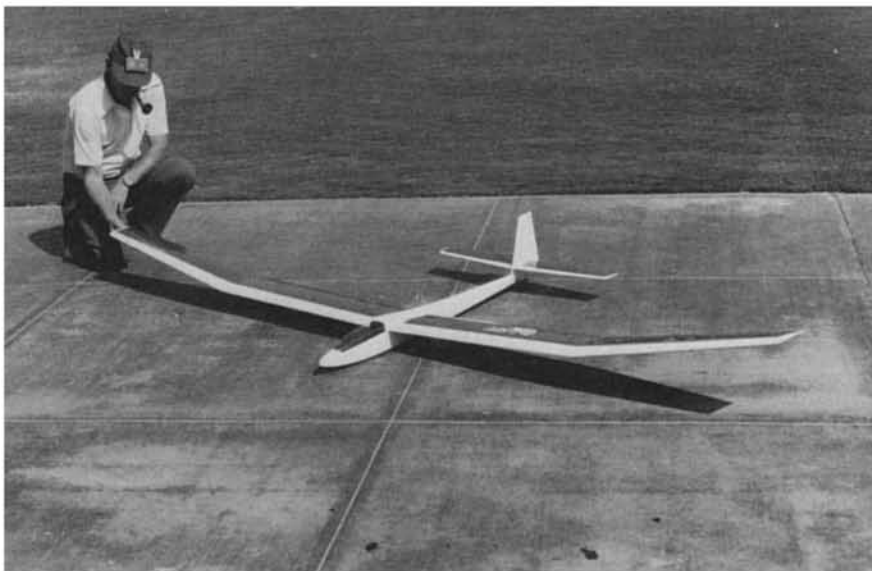
Wing:

Since the wing takes the most time, starting with it will enable you to do other things when various parts of the wing cannot be worked on while the glue is drying. Wing construction is quite conventional with the exception of the center and tip panel joiners and, here, you will have to pay attention to the recommended assembly procedure.

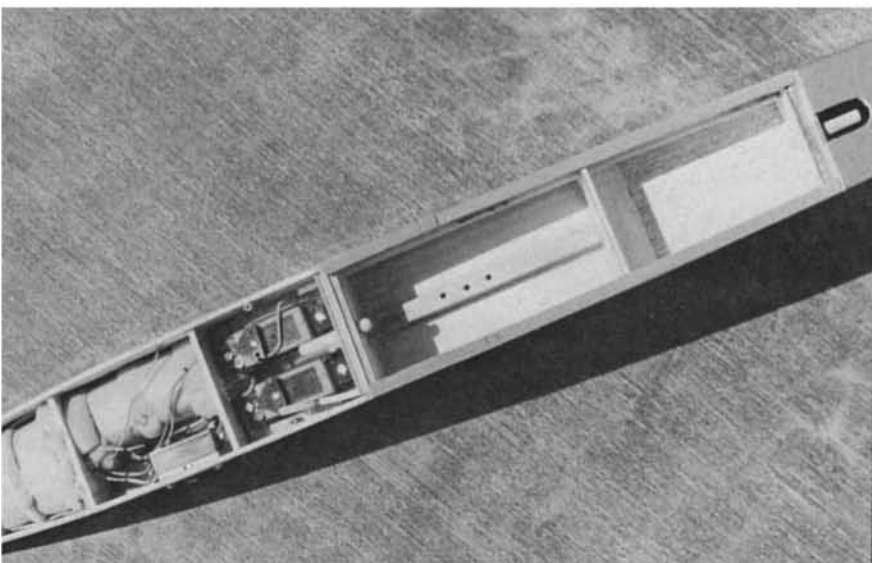
Start the wing by first laying the main panel trailing edge over the plan and marking the location of the ribs. Cut the rib notches to about 1/8" depth. Now pin the trailing edge to the plan (over wax paper, of course). Use a metal straight edge to be sure that the trailing edge is truly straight. Next, pin down the bottom main spar of 1/8" x 3/8" x 29 1/2" spruce, once again using the straight edge. Slip the wing ribs in place, but do not glue. Pin the leading edge in place, making sure that all ribs touch. If you have cut the ribs in stacks, they all should fit the same. If, for some reason some do not, correct by adjustment of the size of the spar notch. You may now cement all the ribs in place **except ribs W1, W2, and W3.**

Mix up some 5 minute epoxy and epoxy the 3/8" hardwood main panel joiner to the bottom spar, making sure that the bottom ridge is directly over the wing centerline. Cut W1 apart to clear the joiner and cement in place, angling slightly to allow for the dihedral. Next, extend the depth of the bottom spar notches in W2 and W3 as required to clear the spar joiner. Cement in place. If you haven't already cut the shear webs, do it now. Remember that the grain of the balsa shear webs is to be vertical. Epoxy the 1/16" plywood shear webs and cement the balsa shear webs.

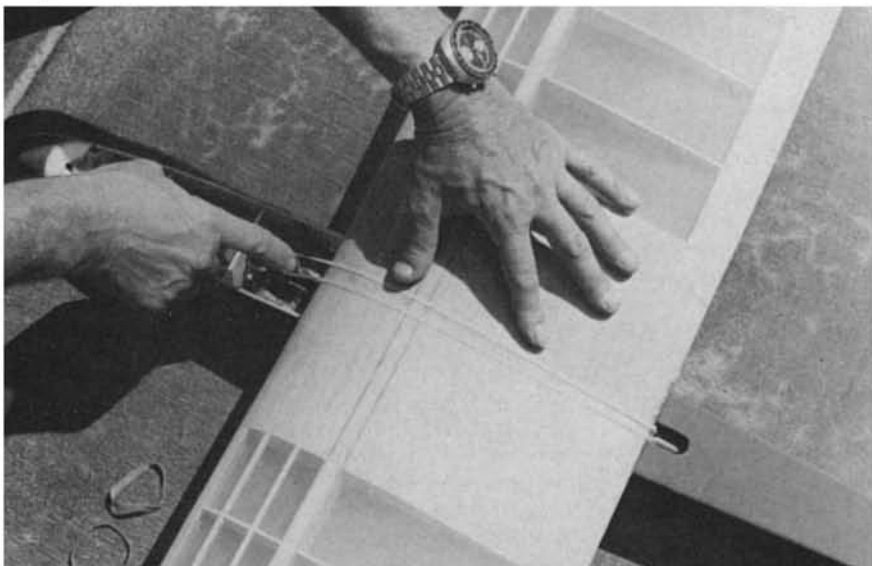
If you have another building board, you



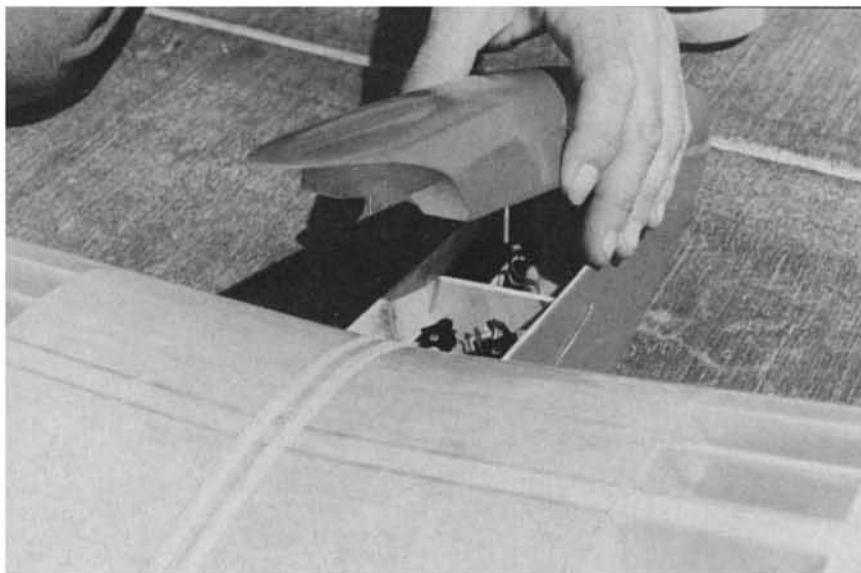
Ed Slobod with one of the many Paragon prototypes built and tested prior to publication.



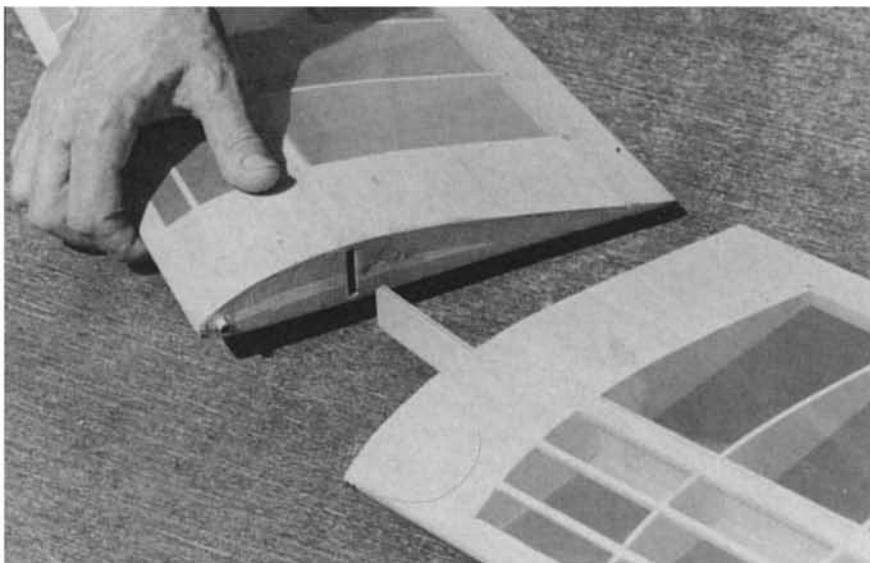
Plenty of room for the radio installation. Note adjustable tow hook in ballast compartment.



Installing the wing center section. Dowels for rubber bands are internal to reduce drag.



Note canopy pin-NyRod hold-down. This is a carved block, but clear canopy is optional, if desired.



A plywood spar joiner used to plug in wing tips. A strip of tape around joint holds panels securely.



Dick Kidd, left, and Don Dewey, right, watch as author puts Paragon together for flight tests by RCM's Editor.

can begin the opposite main panel, while the glue is drying on the first one. **Do not** glue in ribs W1, W2 and W3 (not yet, anyhow)! When the glue has thoroughly set up in the first main panel, it can be removed from the building board and the excess material of the leading and trailing edges and spars trimmed square for joining to the opposite main panel. Place the exposed portion of the main joiner on the opposite main panel bottom spar — push together and check for fit. Trim as required. Prop up the first panel so that the joiner is flush against the opposite panel bottom spar and epoxy in place. Now ribs W1, W2, and W3 can be cemented in place as before. Add the top spar and the shear webs. Don't put in the ply pieces between ribs 5 and 6, they are to be installed later.

The tip panels are next and construction is straight-forward. However, do not install Rib 7 and be sure to taper the trailing edge by trimming the inside edge as shown on the plans. Epoxy the tip panel joiner between the top and bottom spar, making sure that they are perpendicular to the spars and centered.

The next step is to build up the outer panel joiner box. To do this, cut a slot in Rib 6 between the spars and just wide enough to clear the tip joiner. Slip the joiner through the slot and check the fit of the main panel to the tip panel. The joiner should touch the upper and lower spar and the outer panel should be elevated 5/8" measured at Rib 19. Trim the tip panel leading and trailing edges and spars as necessary for a good joint and also site down the spars to be sure that the tip panel does not sweep forward or aft. When you are satisfied with the fit you can remove the tip panel and cut the plywood plates that fit between the upper and lower spars and between Ribs 5 and 6. Coat the portion of the ply joiner that protrudes from the tip panel liberally with Vaseline. Apply 5 minute epoxy to the edges of the plywood plates and slip in place. Now slip the joiner into the main panel and pin or tape to hold alignment. Clamp the ply plates against the joiner.

Wait until the epoxy has started to set up and carefully withdraw the joiner. Wipe off the Vaseline and re-insert the joiner to make sure that nothing has moved. The fit should be snug. If the fit is sloppy you will have to thoroughly clean the joiner and add a layer or two of epoxy to build up the thickness so that the fit is snug. Slip the joiner into the main panel and tape in position. Cut Rib 7 apart to clear the joiner and glue in place. Be careful that you do not glue the panels together. Do the same with the opposite wing panels.

Next, install the 3/16" dowel aligning pin and the 1/16" ply aligning pin support. To do this, separate the main and tip panels and drill a 3/16" diameter hole in Rib 6. Glue the dowel in place, using a balsa spacer between the dowel and the leading edge. Now drill a slightly oversized 3/16" diameter hole in the tip panel. Put the panels together to check that the dowel indexes with the hole. If not, open the hole as



Don Dewey gets ready for a Hi-Start launch as Ed Slobod hooks up tow line.



RCM's Editor circles the Paragon overhead in order for Dick Tichenor to get this photograph.



The author prepares for a night thermal flight. Note chemical lights at dihedral break.

necessary. The leading and trailing edges should be properly aligned and taped. Smear some Vaseline over the protruding portion of the dowel and glue the 1/16" ply alignment pin support to Rib 7. Repeat for the opposite panels. Glue in all 1/8" x 1/8" hard balsa turbulator spars. Fill in between Ribs W1 to W3, W5 to W6, W7 to W8, top and bottom with 1/16" sheet balsa. Add the 1/8" balsa gussets at the tips.

The wing tips are made from 1" triangle stock. After the glue has dried, the upper surface is carved to match the contour of Rib 19. This will automatically shape the wing tip. Carve and then sand the leading edges to shape. (See plans for contour.) Go over all glue joints with a second coat of glue. Give the entire wing a thorough sanding with progressively finer sandpaper, finishing with #400 grit wet or dry, used dry. Cut a notch in the trailing edge as shown on the plans and epoxy in a piece of 1/16" diameter wire. Finally, cover the center section, top and bottom with 2 ounce fiberglass cloth and resin. When dry, sand smooth and you are ready for covering.

Fuselage:

You probably have noticed from studying the plans that the forward fuselage sides and bottom are constructed from three-ply, 1/8" plywood. This special plywood is for door skins and should be available from your local lumber yard. If you cannot obtain this type of plywood, you can use the standard 1/8" plywood available at most hobby shops. The difference will be a slight increase in weight but since most of the plywood is used forward of the C.G. you will require less nose weight, so don't worry about it.

Assuming that all the fuselage parts are cut out, the next step is to epoxy the ply and balsa sides together to make up a full fuselage side. Make sure that both sides are identical. To check, put both sides together and if there are any differences, trim as required to make them exactly alike. Now take one of the sides and pin it over the plan. Epoxy Formers 3, 4 and 5 in place, making sure that they are flush with the bottom edge of the fuselage side and perpendicular. Let the epoxy set up. Next put 5 minute epoxy on the upper edges of the formers and place the other side on top of the formers. Put weights on top to hold the side in position. Now, before the epoxy sets up, go all around the outside perimeter with a square to be sure that both sides are exactly in line with each other. With one blade of the square on the work bench the other blade should contact both edges all around as you move the square around the fuselage. When the epoxy has set up, the fuselage may be removed from the workbench. Next, epoxy Former 1 and the 1/2" triangle stock just aft of Former 1. Join the aft ends of the fuselage after sighting from the rear so be sure that both sides have the same amount of bend. The remaining formers can now be epoxied in place. If necessary, Former 2 may be relocated to accommodate your particular servos.

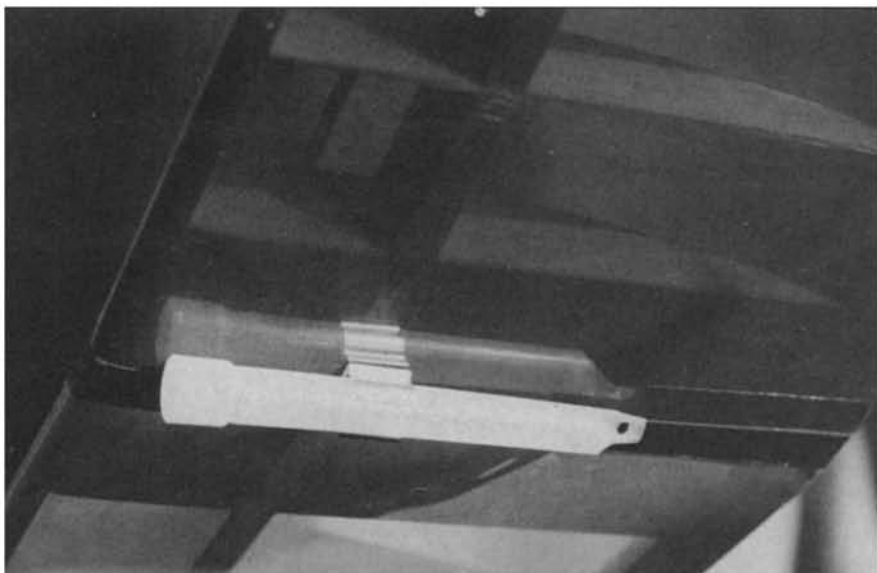
Pre-drill the tow hook block and trim for a

good fit between Formers 5 and 6. Epoxy in place. Now add the triangle stock at Formers 5 and 6 and the 1/16" ply splice plates. Cement the nose block in place. Add the 3/4" triangle stock. Trim to fit by removing material from the side that contacts the nose block. Trace the hatch block profile on a soft balsa block and cut to shape. Install a length of 3/16" diameter dowel in the hatch as shown on plans. Now carefully cut a slot such that the dowel will index with the slot and hold the front of the hatch block down firmly. Bend a piece of pushrod wire (with the threaded portion removed) to the shape shown on the plans. Using a Dremel tool cut a slot in the hatch block about 1/8" deep to receive the wire. Cut two pieces of inner NyRod about 3/4" long and slip over the ends of the wire. Insert the wire into the slot. Place the hatch block in position on the fuselage and, looking up from the bottom, see if the NyRods are touching the inside surfaces of the fuselage sides. If they do not, bend the wire so that they do. Remove the hatch block and epoxy the wire in place. Before the epoxy sets up, replace the hatch block to check that the NyRod sleeves are still touching. Reaching in from the bottom, apply epoxy around the NyRod sleeves. If you have done a good job, the hatch block will be a close, snug fit to the fuselage. If the fit of the wire to the NyRod should work loose, a slight bend in the wire will make it tight again.

The next step is to install the servo mounting supports, located to suit your servos. Before installing the pushrods, you should check the rotation of the servos and route the pushrods accordingly. Try to avoid having the rods cross diagonally over the ballast area as this will make installation and removal of the ballast difficult. Be sure to epoxy the pushrod sleeves to the fuselage everywhere except where it is not possible to do so. Now epoxy the plywood bottom in place. Cement in the 1/8" balsa top and bottom. Next, epoxy the 1/4" diameter dowel wing hold-downs in place, as well as the 1/8" plywood dowel support plates. Use plenty of epoxy here and note that each dowel is angled slightly downward. Next, glue in the 1/8" x 3/8" balsa strips between Formers 3, 4, and 5 on both sides and cap these, when dry, with pieces of 1/4" x 3/16" balsa. Trim these last pieces as noted on the plans to give 1/8" of incidence.

Place the fairing block back on the fuselage, then carve it and the nose block to a rounded shape. All other fuselage corners should be slightly rounded, except where the 1/4" triangle stock is to be cemented to the fuselage for additional stab support. Cement these pieces on now. When dry, sand flush with the top of the fuselage.

Remove the hatch block. Mix up a good supply of 30 minute epoxy and go over every joint that you can reach. Apply enough to form a fillet. When the epoxy is dry, you will find that you will not be able to twist the forward part of the fuselage — it will really be strong! Fuselage covering, if



Close-up of hi-visibility chemical light snapped into place in fuse clip. Cyalume lights available from RCM.



With two chemical lights attached to wing panels and one to the Hi-Start, a night flight begins.



Thermal flying at night adds a "third dimension" to soaring. Note casual, one-handed attitude!

any, is optional but light fiberglass over the entire fuselage is recommended for additional strength, resistance to normal scuffing and abrasions, and as an excellent paint base.

Tail Surface:

The horizontal and vertical stabilizer construction is fairly obvious and requires no special comment. The only feature which you might find different is the use of a hardwood stern post. This is built-in as part

of the fin and is epoxied to the fuselage after the vertical stabilizer assembly has been constructed and covered. You may use any type of hinge that you choose. Scotch Magic Mending Tape was used on the Paragon and we have had absolutely no problems. A solid strip is used on the unbeveled side of the surface and three or four cross strips equally spaced inside the bevel. This type of hinge is easy to apply, is strong, and offers very little resistance to surface movement. If you use this type of hinge, be sure to leave 1/32" gap between the surfaces. The finished horizontal stab is epoxied to the fuselage after the MonoKote in the contact area has been removed. Next, the vertical stab is epoxied in place. Be careful in your installation and be sure they align perfectly, or as perfectly as you can make it.

FINISHING TOUCHES

Using the same 3/32" diameter drill bit that you used to drill the tow hook block, back drill through the bottom plywood using the tow hook block holes as drill guides. The tow hook is made from a drapery hanger of .135 diameter. Trim to length and bend as shown. The first flights should be made with the tow hook in the forward hole. As you become more familiar with the launch characteristics of the Paragon you will want to move the tow hook further aft for maximum climb on the launch. The Paragon goes up very steeply, even when the hook is in the first hole, so get used to this before making any changes. The hook, as you can see, is extra long and extra strong, and while not necessary for launching from a Hi-Start, you will be glad it is there when you launch with a 12 volt winch with two or more pounds aboard for those FAI speed runs.

Install your radio equipment and check that everything works properly and smoothly. Add ballast to the nose area, in front of the battery pack, to place the balance point under the main spar. This is a good starting point and you can adjust the C.G. to your own preference after you have had a few flights.

Sand the inner edges of the wing rests to match the dihedral angle and cap with seating tape. The wing is held in place with 5 or 6 #72 rubber bands. The wing should be held firmly but not so tightly that it cannot move if a wing tip should hit. Install the hatch block and trim as required to clear the wing and the rubber bands.

ADJUSTING, TRIMMING AND FLYING

Sailplanes with polyhedral wings usually do not require washout but the Paragon goes up on the launch very steeply and can be circled tightly, and a little washout is tip stall insurance, so it is a good idea to put in about 3/16". There should, of course, be no other twists, warps, or misalignments.

You are now ready for the first test flight which should be a hand glide. Throw the model hard enough to obtain about 10 feet of altitude, feed in some down stick at the top of the launch to level the model off, and let it assume its glide. Adjust any nose or tail heaviness with the addition or removal of nose weight. When you are satisfied with the C.G. position, and if nothing else strange is happening, you are ready for a Hi-Start or winch launch. There should be no surprises on the launch, except that the model gets off at a steeper angle than you may be used to. Be sure to fly the model enough to be thoroughly familiar with it before attempting any night flights.

NIGHT FLYING

In addition to the usual things necessary for day flying, you will need some form of lights to put on your model and at the end of the launch line. We have been using, almost exclusively, a form of

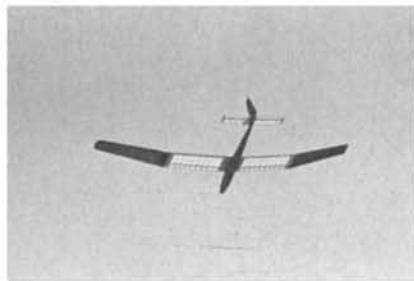
chemical light known as CYALUME with excellent results. RCM Products Division stocks this Cynamid product. The lights are approximately 5" long, and 5/8" in diameter, and weigh about 3/4 ounce, and the price will be 3/\$4.75 pp. They consist of an outer sleeve of transparent plastic and an inner sleeve of glass. Each contains a liquid and when the glass is broken by bending the light slightly, the liquids intermix and glow. A minimum of two lights are required for each model and they are secured to the wing tips or the underside of the wings at the dihedral breaks. Scotch or masking tape will work just fine. The lights naturally grow dimmer with time, but will remain bright enough for about six hours of flying.

Your first attempts at night flying should be made on a night when there is some moonlight. Get to the field before dark, set up and make some flights to get some idea of how much area you will be using to land (of course, your landing area should be completely devoid of obstructions). If you have a choice of sites, choose one that is not

near a busy street or ringed by other sources of light. When your ship is up, all you will see will be two small dots of light and you don't want to be distracted by street lights or the glare of auto headlights.

Sound scary? It really isn't all that bad. We have had more than six night flying sessions including a 15 minute precision with landing bonus contest with no damage to any of the sailplanes.

Whether flying at night, in contests, or as a first sailplane, you will enjoy the Paragon — one of the easiest, but most versatile, sailplanes you will ever fly. □



PARAGON

PARAGON

Designed By: Ed Slobod

TYPE AIRCRAFT

R/C Sailplane

WINGSPAN

118 Inches

WING CHORD

10 Inches (w/tapered tips)

TOTAL WING AREA

1080 Square Inches

WING LOCATION

Top of Fuselage

AIRFOIL

Flat Bottom 12%

WING PLANFORM

Constant Chord Center

Panels w/tapered tips

DIHEDRAL, EACH TIP

8 1/4 Inches

O.A. FUSELAGE LENGTH

50 1/2 Inches

RADIO COMPARTMENT AREA

(L) 9" X (W) 2 1/2" X (H) 2 1/4"

STABILIZER SPAN

28 Inches

STABILIZER CHORD (incl. elev.)

5 1/4" (Avg.)

STABILIZER AREA

144 Square Inches

STAB. AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

11 1/2 Inches

VERTICAL FIN WIDTH (incl. rudder)

6 1/2" (Average)

REC. ENGINE SIZE

NA

FUEL TANK SIZE

NA

LANDING GEAR

NA

REC. NO. OF CHANNELS

Two

CONTROL FUNCTIONS

Rudder and Elevator

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage Balsa and Ply

Wing Balsa, Ply and Spruce

Empennage Balsa and Spruce

Weight Ready-To-Fly 48 Ounces

Wing Loading 6.4 Oz./Sq. Ft.