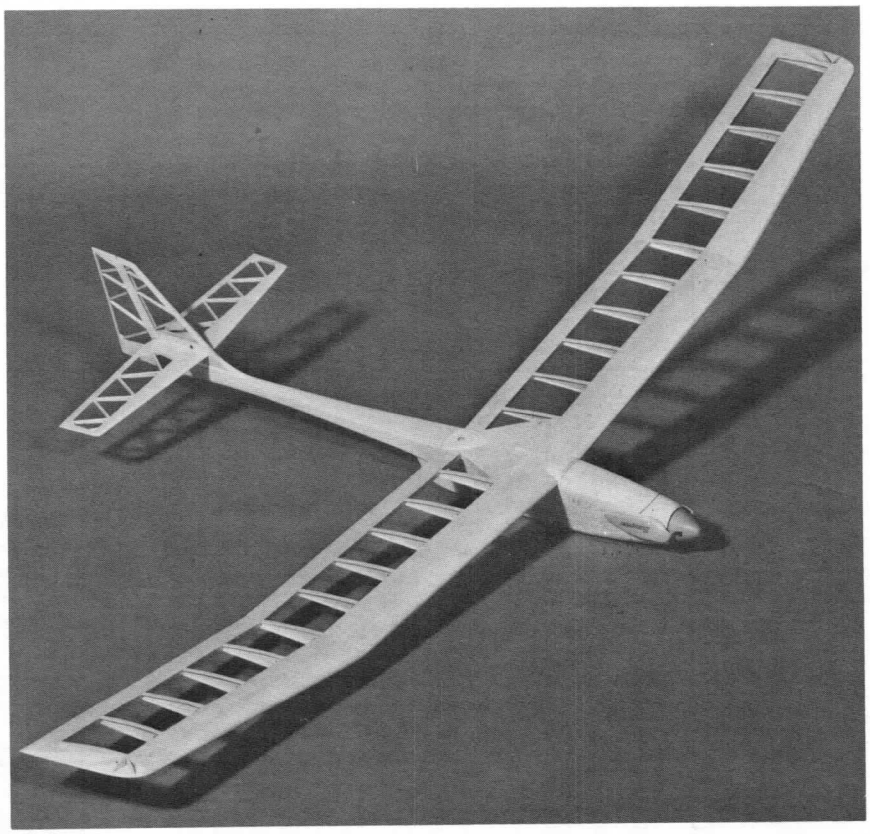
PHASOAR

RC-38 PHASOAR 035 INSTRUCTION MANUAL

I. INTRODUCTION

The PHASOAR 035 from Top Flite Models, Inc., utilizes its unique looks and design to deliver electric-powered performance at the flying field! All of the latest technology has been employed in designing this model, starting with the silent, but powerful, **ASTRO FLIGHT** Cobalt 035 Electric Motor. This motor, with a **GRAUPNER** 7 x 3 folding propeller unit and a **SR** 1000 or "Magnum" 1250 mAh battery pack (6-cell), has rocketed our prototype PHASOARS to 700 feet in 55 seconds! This was done up to five times on a single charge!



Aerodynamically, your PHASOAR has a light, straight-forward and strong airframe. There's no need to disassemble the model to get at the batteries because its single-screw release allows quick access to the battery pack. This allows you to charge batteries while still in the pod or remove them for charging while a second pack is being used. The full-flying stabilator allows the model to be quickly and dynamically trimmed for power-on/power-off flight. The PHASOAR's airfoil allows flying in wind conditions that would ground most of the flat-bottom types and, yet, provides a great thermal-hunting glide. The generous rudder area and the appropriate polyhedral of the wing panels allow quick detection of the core of the smallest thermals for long unpowered flights.

Finally, the PHASOAR is perfectly sized to let you take it most anywhere and enjoy true, high-performance electric flight.

IMPORTANT NOTE:

If you are a beginner to the sport of R/C flying, we would urge you to seek and use experienced assistance in constructing and flying this airplane. All model airplane hobbyists should remember that:

Flying this or an other radio-controlled model aircraft is a **PRIVILEGE** and not a **RIGHT** and this privilege begins with the utmost safety considerations to others and yourself as well. An R/C model airplane in inexperienced hands has the potential of doing serious personal or property damage. These safety considerations start at the building board by following instructions, seeking competent help when you are confused and avoiding short-cuts. These considerations have to be carried over to the flying field where safety must come first. We urge you, if you have not already done so, to:

1. Send for and obtain your **Academy of Model Aeronautics (AMA)** membership which provides insurance for your R/C activities--**DO NOT RELY ON HOMEOWNERS INSURANCE.**

TOP FLITE MODELS INC.

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2. Join an AMA-sanctioned R/C flying club in your area where you can obtain experienced guidance and instruction in trimming and learning how to fly this model.

Many local hobby shops have the required AMA forms or can advise how/where they can be obtained.

WARNING!!!

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A radio controlled model is NOT a "toy." Care and caution must be taken in properly building the model, as well as in the installation and use of the radio control device. It is important to follow all directions as to the construction of this kit as well as installation and use of the engine and radio gear. The advice and assistance of a well-experienced builder and pilot is highly recommended. Don't take chances! Improper building, operation, or flying of this model could result in serious property damage and/or in serious bodily injury to yourself or others.

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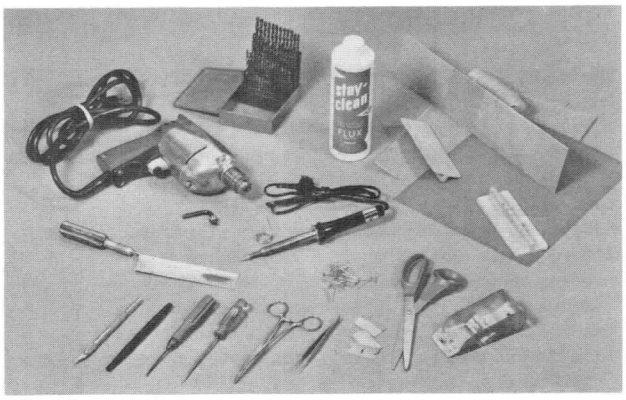
II. PRE-CONSTRUCTION NOTES

The PHASOAR, like other Top Flite kits, employs the use of die-cut wood to ease the task of construction, part fit and identification. Die-cut parts may be removed from their sheets by first lightly sanding the back of each sheet before carefully removing each part. Use a light garnet paper for the sanding and keep a sharp hobby knife with a #11 blade handy for assistance in removing any parts that might not have been completely cut-through by the dies. Parts which oppose one another must be precisely uniform (such a ribs, etc.) and should be carefully "matched" after their removal from the part sheets. Matching is the process of holding the pieces together with either pins or tape, or by spot gluing and lightly sanding the edges of the parts until they are identical. A sanding block with light garnet paper is most useful for this.

Your flat building surface should be at least large enough to accommodate the wing, yet be able to accept pins easily. A product such as **Celotex** fiber board works well. Another good surface is a 2' x 4' fiber board ceiling tile.

As with most R/C kits that are constructed from wood, a selection of tools and accessories greatly help do the job correctly:

* Hobby knife with sharp #11 blades
* Single-edge razor blades
* T-pins
* Sanding blocks in assorted sizes
* Sandpaper in various grits
* Hand-held hobby saw, such as an **X-Acto**
* **Dremel** tool or power drill and assorted drill bits
* Straight-edge, preferably metal, at least 36" long
* 90" triangle
* Soldering iron, flux (such as **HARRIS'** Stay-Clean) and solder (silver)
* Carbide cut-off wheel for wire cutting
* Small power jig-saw, such as a Moto-Saw
* Razor plane
* Tapes, such as masking and cellophane



Our PHASOARS were constructed using a variety of common hobby adhesives including 5-minute epoxy and cyanoacrylate (CA). Type of glue used may vary according to individual preference. However, during the construction there will be call outs for certain types of adhesives, and we urge you not to substitute since doing so could possibly cause structural problems.

Left to right:

*Good quality 2-part 5-minute epoxy
*Good quality, sandable filler
*CA accelerator for CA glue
*Good quality, slow-set CA glue

Lastly, the sequence in which the PHASOAR is assembled has proven to be the most straight-forward and provides finished components in the order in which you will need them to progress to

the next assembly phase. Maintain the building order presented here to avoid mistakes.

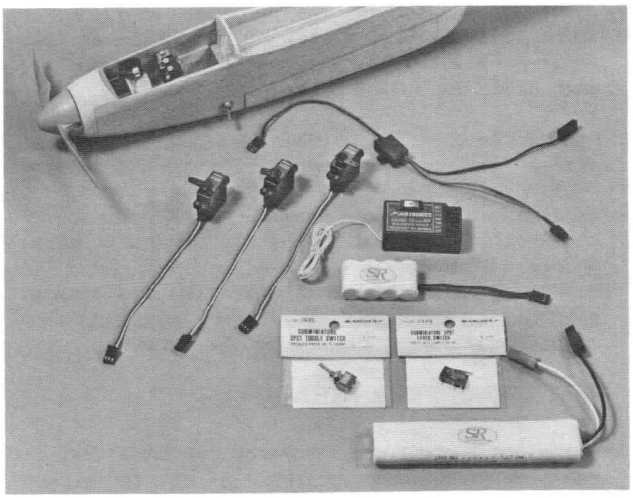
Spread the plans out on your work surface, cover them with a clear plastic material, such as the backing from a roll of MonoKote or plastic wrap, and commence construction.

III. RADIO SYSTEMS

Our prototype PHASOARS have been tested and flown using two radio types from different manufacturers.

The first of these radio systems is the one depicted on the plans. The system consists of a standard-sized 6-channel receiver (**AIRTRONICS** #92262), three micro-servos (**AIRTRONICS** #94501) and a standard-sized, internally-mounted switch harness (**AIRTRONICS** #97001). Power is supplied to this system by a 4-cell **SR** 300 mAh battery pack, fitted with an **AIRTRONICS** connector. The servos have been fitted with the 4-arm servo output arms, with three of these arms cut-off and the remaining arm trimmed as shown on the plans.

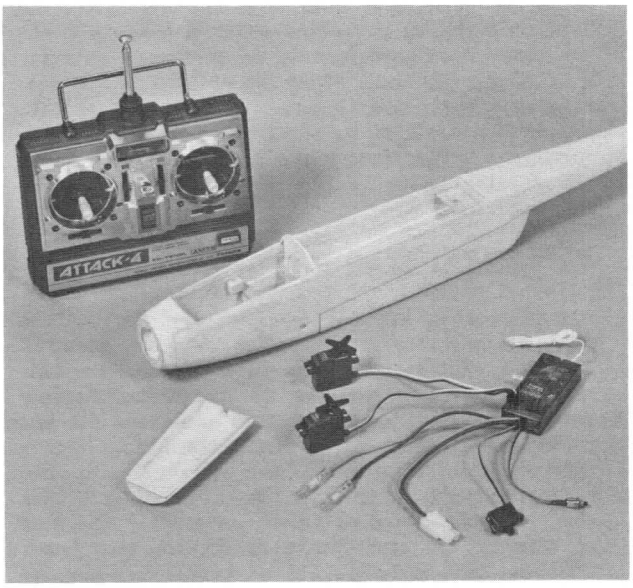
These three servos drive the rudder, stabilator and the ON/OFF micro motor switch.



The radio system just described is very acceptable in terms of weight and reliability!

The transmitters we've used in conjunction with the above system were the **AIRTRONICS** Championship Series 6-channel and the **AIRTRONICS** SR Series 4-channel. Both of these worked well. Whatever system you choose, we suggest that the minimum requirement is servo-reversing ability.

The second radio system that we've used is made by **FUTABA.** This radio system has sophisticated features that work well in the PHASOAR. First, when using this system, your servo count goes from three to two, because the receiver also houses a fully-proportional, motor controller. Secondly, the receiver and servos are powered by the motor battery pack, thus, eliminating the need for a separate, on-board battery supply for these components! This means that there is no need for a micro-switch, the wood mounts, the hardware to mount these parts and no need for the arming switch because the **FUTABA** system has all of these components built-in. This system is available with **FUTABA**'s #S-133 servo included. The S-133 servo has almost the same dimensions as the **AIRTRONICS** #501 servo, thus no adjustment to the plans in the servo area is required. Lastly, this system includes **FUTABA**'s Attack-4 transmitter which is equipped with servo-reversing.



FUTABA's System #4NBL 133MN 72 designates the radio which will provide all of the components just mentioned.

For comparison, the airborne weight of the **FUTABA** system is 3.25 ounces. The **AIRTRONICS** system described earlier, with the micro-switch, mounts, hardware and arming switch weighs or 5.93 ounces. The difference amounts to 2.68 ounces, or nearly a 10% loss of weight for the model which uses the **FUTABA** system!

There are other systems that would also work in the PHASOAR.

Have whichever radio system selected available for sizing and fitting purposes during construction.

IV. MOTOR AND PROPELLER CHOICES

The PHASOAR has been designed and engineered to be powered by the **ASTRO FLIGHT** 035 Cobalt motor, using direct drive. This motor is relatively small, light-weight (about 130 grams), very powerful for

its size and quite easy to mount/install. It swings a 7-3 or 7-4 propeller and accepts a wide variety of battery packs.

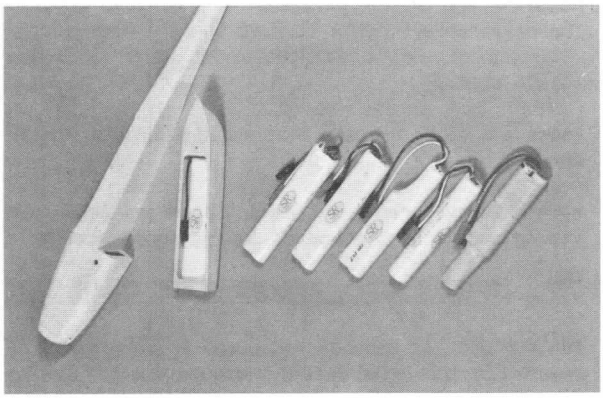
There are other motors that will fit into the PHASOAR's nose, e.g., the **KYOSHO** LEMANS 360, the **MABUCHI** RS-380SH, and the **ASTRO FLIGHT** 020 Cobalt, etc. We must, however, forewarn that these motors are not going to yield the kind of high-performance climb-to-altitude that the PHASOAR has been designed for. Decide now which motor you want to use because you will be fitting it to the fuselage during construction.

The propeller choice always tends to be a function of experience in flying the model. Therefore, propeller sizes and diameters can and should be "played with" to determine which one works best. Our first recommendation is to seriously consider a folding propeller. Since the PHASOAR is, in non-powered flight, a sailplane, it derives a certain amount of efficiency by being quite aerodynamically "clean." While fixed-blade propellers work well, the folding units tested performed better after cutting power.

V. BATTERIES

Your PHASOAR's battery pod has been designed to carry six (6) AA-sized batteries, or four, possibly five (if configured appropriately), "Sub C" type batteries. The capacities of these two battery types can and do vary and it is important for you to know at least some of the differences. It is also important to know that the current drain, when using the **ASTRO FLIGHT** 035 Cobalt motor, is higher than that of a ferrite-type "can motor." Because of this, it is appropriate to provide your model with the best possible set of batteries, both in terms of capacity and certainly in terms of weight.

Why worry about weight? The single heaviest, FIXED WEIGHT item that your PHASOAR must carry aloft is the battery pack. This weight directly influences the wing loading of the model which dictates how the model behaves when the power is OFF.



The photograph shows the five (5) battery-pack types and capacities that we've used to power the PHASOAR.

First, on the left in the pod, is the **SR** 1250 mAh "Magnum" 6-cell pack. Moving from left to right in the row of five packs, is another **SR** 1250 "Magnum" pack. The next pack shown is the **SR** 1000 pack, then the **SR** 1000 pack in a 5-cell format. Next is the 4-cell, Sub-C **SR** 1000 pack, and at the far right is a 5-cell pack made-up from **Sanyo** 800 cells. The weights for these units (all with connectors) are as follows:

SR 1250 6-cell "Magnum" pack. . 7.43 oz.
SR 1000 6-cell pack . . . . . 7.60 oz.
SR 1000 5-cell pack . . . . . 6.43 oz.
SR 1000 4-cell Sub-C pack . . . 6.09 oz.
Sanyo 800 (mAh) 5-cell pack . . 6.52.oz.

These numbers are revealing, especially when tied into the capacities (potential amount of power) of each of the packs and their effects on the model's wing loading. All five of these packs have been used in testing the PHASOAR and all five have worked well. The best all-around battery pack has been the **SR** 1250 (mAh) 6-cell pack, since it provides the amount of power that the 035 Cobalt thrives on. At the same time, it has an acceptable weight for thermal hunting with the PHASOAR's wing area (335 sq. inches) and resultant wing loading (with this pack in place) of 11 ounces/sq. ft. using the **AIRTRONICS** equipment or 10 ounces/sq. ft. when using the **FUTABA** system.

To get the most out of your PHASOAR, in terms of flying time, consider obtaining three (3) battery packs. In this way you can be flying almost constantly because one pack will be in the model, one pack will be cooling and the third will be on charge. With only a single flight pack you could conceivably have to wait 35 to 40 minutes between flights. Be sure to follow manufacturer's recommendations for recharging the batteries.

VI. BATTERY CHARGERS

There are a great many chargers available for re-charging Nickel-Cadmium batteries (Ni-Cads); too many to test them all. We have had success with the two we use and, therefore, recommend these to you knowing that many others may work out just as well.

For fast charging (15 to 20 minutes) the **LEISURE** #107 AC/DC model works well and can be either used on your auto's 12-volt battery or plugged into a 110 volt wall socket. Great for quick charges at the flying field.

For slow charging **ACE R/C**'s DUAL-METERED VARI-CHARGER (#34K32) is available in both kit form and pre-assembled. It allows two battery packs to be charged simultaneously. Super when you have the time at home to top-off the charge in each pack.

VII. WING CONSTRUCTION

Be sure and protect your plans by covering them with backing from a roll of MonoKote or a material such as clear food wrapping. Take a minute to study the plans and understand them. We suggest building a right and left wing panel, starting with the inboard sections. We'll start with the left wing first.

1. From the 1/16" x 3" x 30" sheeting provided, cut, fit and locate over the plans, the bottom leading edge sheet (use a long straight edge to develop the correct width and to true-up the edges). From the 1/8" x 3/16" spruce spar stock provided, measure and cut the required 15" length for the bottom spar, set this aside . Now cut and locate over the plans, the 1/4" x 1" length of shaped trailing edge stock. Next cut and glue the bottom center section sheeting in place to the trailing edge stock and the forward bottom wing sheet. Cut, fit and glue in place the six bottom 1/16" x 3/16" cap strips from the stock provided. Using one of the die-cut W-2 wing ribs as a location guide, the bottom spruce spar (cut earlier) can now be glued in place. Lastly, note in the cross sections that the leading edge of the bottom wing sheeting needs to be lifted up and supported in order to match the bottom contours of the wing ribs, forward of the spar. This is best done with a length of trailing edge stock.

2. Note the "tick" marks just in front of and just behind the wing panel drawings. These correspond to the rib locations. Use a straight edge and a soft lead pencil to mark the rib locations directly on the leading edge and center section sheeting. The first wing rib to be installed is the first W-2 rib, inboard from the polyhedral break (the inboard end of polyhedral brace W-10 will butt against this rib when it is installed). Continuing to work inboard, toward the center, install the next three W-2 ribs. From their die-cut sheets, remove ply dihedral braces W-8 and W-9 and polyhedral braces W-10 (balsa). The two remaining inboard W-2 ribs must now be cut to compensate for the installation of the W-8 and W-9 dihedral braces; use these braces as a thickness guide and trim the ribs as shown on the plans. Finally, root rib W-1 must also be trimmed into two pieces to fit in front of and behind the dihedral braces. Once this is done, holding W-8 in place again as a guide, glue all of the remaining forward rib ends in place to the bottom leading edge sheeting; remove W-8 from the structure. Using W-9 as a guide, glue all remaining rear rib ends in place and remove W-9 from the structure. The remaining outboard W-2 rib must be trimmed in a similar manner. Using the same procedure as described, trim this rib into a front and rear piece and glue in place using W-10 as a spacer; remove W-10 from the structure.

3. Cut, fit and glue the 1/4" sq. leading edge in place.

4. Carefully remove this structure from your work surface. Use a sanding block to lightly sand the outboard edges (the polyhedral break) smooth. Place the structure back on the plans and block up the center 2-1/2." Using the same construction as described earlier, the outer wing panel is now built directly over the plans and directly to the inner panel. Take pains to bevel the trailing edge butt joint for a good fit. Be sure to install W-10 first before the front and rear segments of W-2, followed by W-3, W-4, etc.

5. With all of the ribs in place, cut, fit and glue the top spruce spar in place from W-7 to the W-2 at the polyhedral break. From your parts bag, locate the bundle of ten vertical grain shear webs. Carefully trim one of these to fit between W-3 and W-2 and against the spars and W-10 with the top flush with the top of the spar. Once satisfied, glue this web in place.

6. As shown on the plans, the 1/4" sq. leading edge must now be sanded down to match the top contours of the ribs. The razor plane then sanding block work great here. Once satisfied, cut, fit and glue in place the top 1/16" leading edge sheeting (note that this top sheeting is placed slightly forward on the top spar thus creating a bit of a "shelf"). Lastly, cut, fit and glue in place all of the top 1/16" x 3/16" cap strips with the exception of the one which will cover the W-2 ribs at the polyhedral break. Remove the left wing panel from your work surface. Use your sanding block to smooth the outboard face of W-7 in preparation for the wing tip. Inspect the bottom polyhedral joint and lightly sand as needed.

7. The right wing structure is now built using the same procedures just described.

8. Next, the right and left wing halves will be joined together. Preparation for this requires that the two inboard ends of the wing halves be sanded smooth and beveled to create a good, straight fit. Do this now. Pin or weight one of the wing halves (let's use the left) flat to your work surface. Next, make sure the rib curve in the bottom leading edge sheeting is

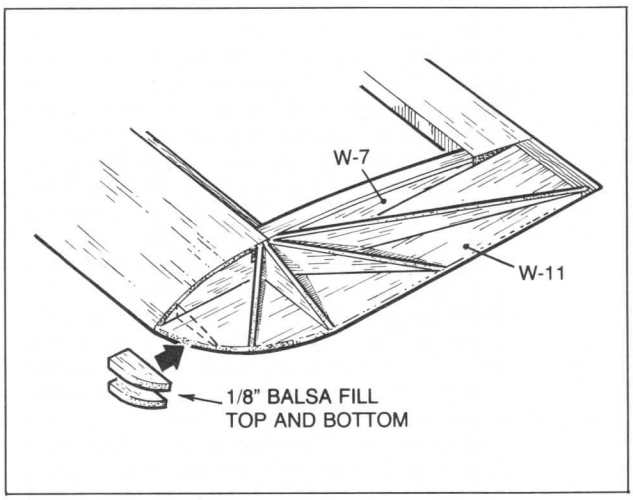
supported with a length of trailing edge stock. With everything secure, trial-fit the right wing half in place with its polyhedral break supported 2-5/8" off of the work surface. The resulting butt joint should be as flush fitting as possible and the leading and trailing edges of both inner panels should be straight; take your time here and ensure that the fit is the best you can produce, with all parts lining-up correctly. Once satisfied, apply a thin, even coat of glue (5-minute epoxy) to the inboard end of the right wing panel and carefully fit it to the pinned down left panel, again making sure the right panel is raised 2-5/8" at the polyhedral break. Carefully wipe off any oozing adhesive. Now, fit W-8 dihedral brace in place, trimming if needed for a good fit. Glue W-8 in place. Cut, fit and glue the left panel's spruce spar in place. Rear dihedral brace W-9 can now be glued in place.

9. With the left wing still down flat to your work surface, locate the vertical grain shear webs (1/16" balsa). Cut, fit and glue these in place between the remaining W-2 ribs, out to the polyhedral break.

10. Remove the joined wing structure from the bench. Pin or weight the right panel in place to the bench and glue the remaining top spruce spar in place followed by the remaining vertical grain shear webs.

11. As you did with the wingtip panels, carefully shave and sand the inner panel's leading edges to conform with the top contours of the wing ribs. Use your sanding block to lightly sand any high points on the panel's top surfaces. When done, the inner panels are ready to sheet. Pin or weight one side or the other in place on your work surface. Cut, fit and glue the leading edge sheeting in place (again leaving a bit of a "shelf" at the rear edge of the top spar). Cut, fit and glue the center section sheeting in place using the patterns shown on the plans. Finally, install all of the remaining 1/16" x 3/16" cap strips out to and including the polyhedral break. Repeat this procedure on the opposite wing panel.

12. Locate and remove wing tip parts W-11 from their die-cut sheets. Sand their inner edges lightly to render them flat and straight. Note the tip reinforcement option shown on the plans. This addition of a length of 1/8" x 3/16" spar stock really "beefs-up" an area prone to stress in an accident. Glue the W-11 wing tips in place as shown on the plans ("End View of Wing tip" left panel). Also as shown below, cut a few scraps of 1/8" balsa to fill in the leading edge of the wing tip and glue these in place. From the remaining 1/16" balsa sheet provided in your kit, cut, fit and glue in place the wing tip braces as shown on the plans. On our prototypes we added these braces top and bottom.



The completed wing structure should be carefully sanded to final shape including the leading edges.

At this point your PHASOAR's wing structure is nearly complete. Later, after the FUSELAGE ASSEMBLY, we will insert the forward 3/16" dia. x 1-1/2" hold-down dowel, drill the center section trailing edge for the hold-down screw and add the front and rear balsa wing/fuselage fairings.

VIII. STABILATOR CONSTRUCTION

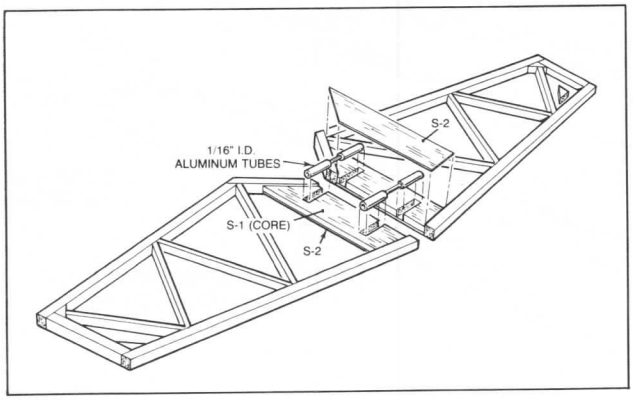
Studying the plans you'll note that the entire tail group (stabilator, fin and rudder) for your PHASOAR consists of flat "plate" structures, which have die-cut "core" parts and die-cut "cap" parts. These structures are sanded to airfoil shape (shown on plans) after assembly. Although these structures are quite straight-forward in design, it remains important that care be taken in cutting and gluing the required parts together.

1. From the small parts bag, locate and remove the single 3" length of 1/16" I.D. aluminum tubing and two of the four 1/16" dia. x 1-1/2" lengths of music wire (M.W.). Carefully measure and cut-off four(4) 5/8" lengths of the aluminum tubing, using a single-edge razor blade with a rolling motion on a hard surface. Be sure to save the remaining 1/2" length of this tubing for later use.

2. Locate and carefully remove the 3/32" die-cut core parts S-1 (2 each) and S-2 (2 each), and the 1/16" cap parts S-3 (4 each). Make sure your stabilator plan is covered with clear protective material and position each of the S-1 parts in place - weight or pin. Glue the S-2 parts in place to each S-1, directly over the plans. Remove the two resultant structures from the plan and, holding them together, lightly sand their outer edges to match exactly.

3. In this step you are going to glue each of the S-1/S-2 structures to a S-3 cap part, a bottom left and right. Apply a thin coating of glue to the bottom of each S-1/S-2 structure, keeping it out of the slots, and pin or weight in place over the bottom S-3 cap. Once again, remove the two resultant structures from your building board, hold them together and light-sand their outer edges flush with each other. Re-position these parts back over the plans and securely pin or weight in place.

4. Now test-fit each of the four (4) 5/8" lengths of aluminum tubing in place into the slots provided in the S-1/S-2 parts with both of the 1/16" x 1-1/2" M.W. rods in place. This is a good time to trim anything that does not fit well. Refer to drawing. Note that the two M.W. rods are meant to be parallel with each other when in place. Using 5-minute epoxy, glue each tube in place into each slot in each S-1/S-2/S-3 structure, being careful to keep glue out of the tubes - allow to cure.

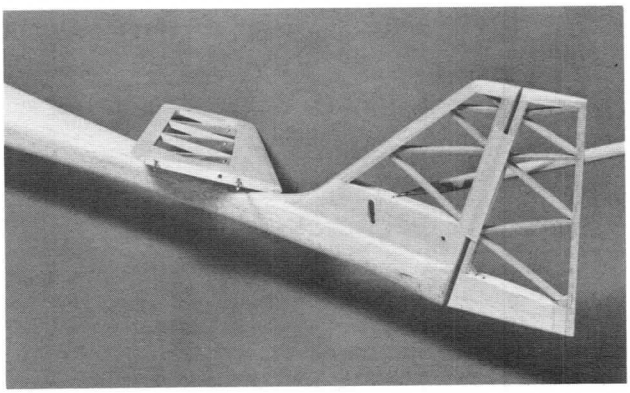


5. Apply a thin coat of glue to the bottoms of the two remaining S-3 top caps and pin or weight these in place directly over the tops of the S-1/S-2 structures, carefully lining-up the inboard edges. Remove the two structures from your building board and remove the two 1/16" dia. x 1-1/2" M.W. rods and pin or weight directly over the plans.

6. Cut, fit and glue the 1/4" x 3/8" balsa trailing edges and tips in place - pin or weight securely. From the 1/4" balsa stock provided in your kit, cut, fit and glue the two required tip corner gussets in place. Again using the 1/4" balsa stock, cut, fit and glue the leading edges in place.

7. Using the 3/32" x 1/4" balsa stock provided in your kit, cut, fit and glue the diagonal geodetic "ribs" in place, using the plans as a guide. Take care here to create the best joints that you can. Using the trim lines shown on the right stab side, trim the right stab tip as shown. Remove the stabilator structures from your building board. Holding the right stab half over the left, trim the left stab half tip to match the right. While still holding the structures together, sand the rear, inboard trailing edge "notches" per plan.

8. The stabilator halves should now be complete and matched. Further, when joined together with the 1/16" M.W. rods, they should be flat in relationship with one another. The last step is to sand these halves to airfoil shape as shown on the plan.



Note holes through geodetic ribs and root section of stabs and a similar hole through bottom of rudder and through top of TC-1's on fin. These are "breather" holes for covering purposes. They allow hot air to escape the structure, allowing MonoKote to fully shrink.

IX. RUDDER CONSTRUCTION

1. Locate and carefully remove the two required R-1 die-cut rudder cores from their sheets. Do the same for the two required 1/32" RC-1 rudder cap parts. Start construction by gluing the two R-1 parts together, taking care to match their outer edges with each other. Pin or weight the R-1/R-1 structure in place over the plans.

2. Cut, fit and glue the rudder's 3/16" sq. balsa leading, top and trailing edge in place. Glue one of the RC-1's in place directly over the R-1/R-1 structure, matching each edge. Locate and remove two of the die-cut 1/32" x 3/16" x 8-1/2" fin and rudder cap strips from their sheet. As shown on the plans, the cross-hatched areas at the leading edge and top of the rudder are "capped" with this capstrip stock - do this now. Remove the structure from the plans and lightly sand the "capped" side smooth. Place the structure back on your work surface, opposite side up, and glue the remaining RC-1 and capstrip stock in place. Again, lightly sand this side of the rudder smooth. Re-position the rudder assembly in place over the plans - pin or weight.

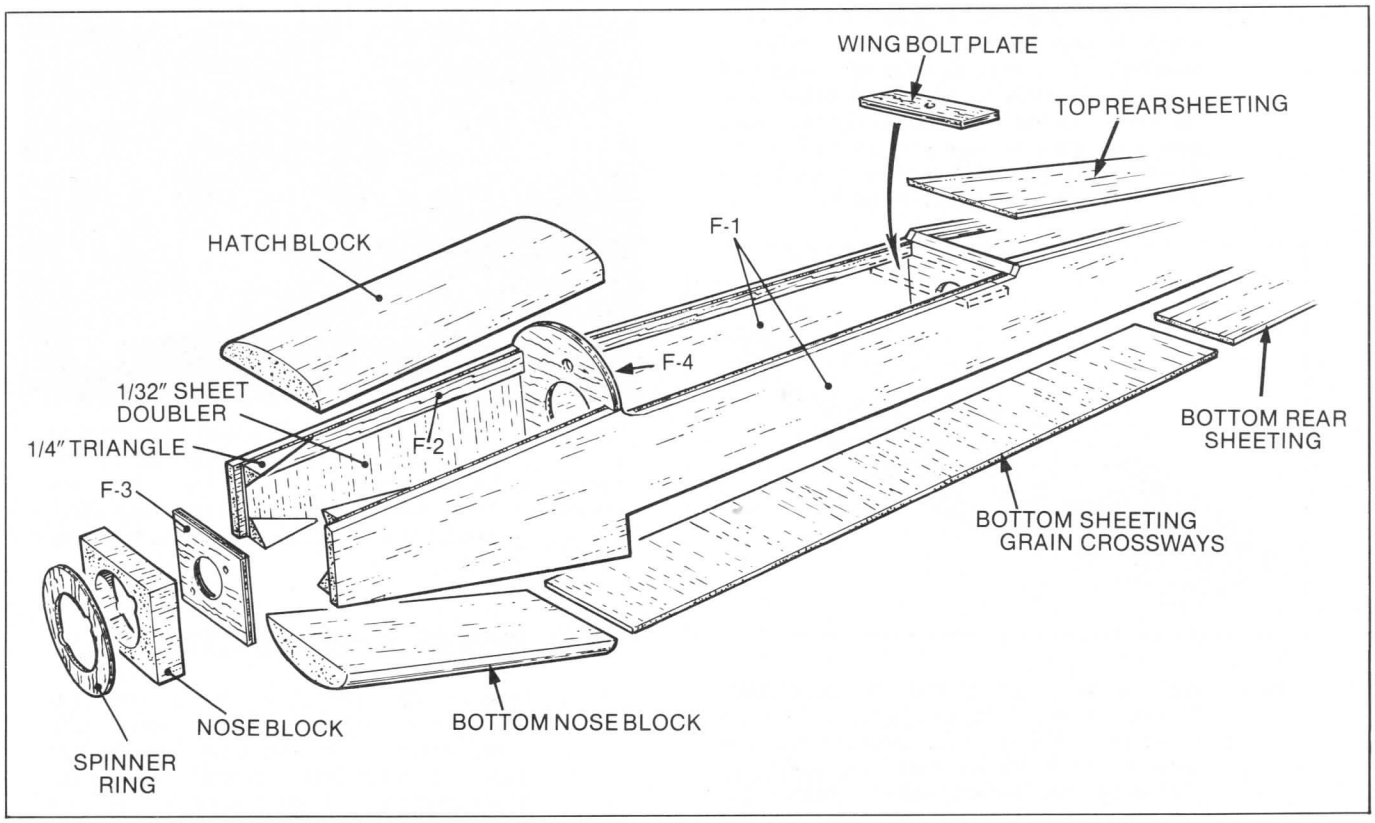
3. Using the 1/4" sq. balsa stock provided, cut, fit and glue the two bottom, leading and trailing edge corner gussets in place. Using the 3/32" x 1/4" balsa provided, cut, fit and glue the diagonal geodetic "ribs" in place, using the plans as a guide. Again take care to create the best joints that you can.

4. Remove the rudder structure from your work surface and use a sanding block to smooth each of the four outer edges and the left and right surface of each side. With the exception of the addition of the 1/32" ply rudder control horn and the 45-degree bevel for hinging, the rudder is now complete and can be sanded to the shape shown on the plans. Set the structure aside for later fitting to the fin.

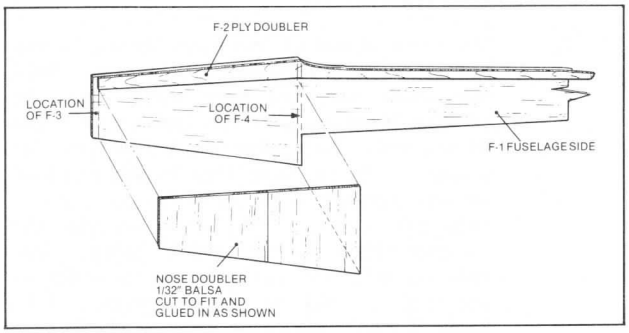
X. FUSELAGE/FIN CONSTRUCTION

Note that the fuselage and fin, with the stabilator drive, are constructed as a single unit.

1. Remove the two fuselage sides from their die-cut sheet. Tape, pin or clamp them together and use a sanding block to lightly sand their edges, thus matching them exactly. Remembering that a left and right side is required, glue F-2 on the fuselage sides as shown below on the assembly of nose and forward fuselage drawing.



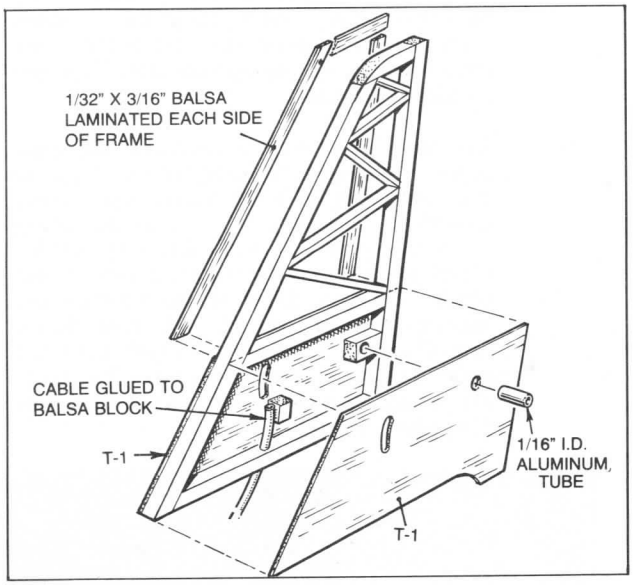
2. Glue 1/4" triangular corner blocks, leaving space for F-3 at forward edge of fuselage. Using F-3 and F-4 for spacing, cut and glue 1/32" vertical-grain nose doublers.



3. Add 1/8" longerons and uprights per sections E-E, F-F, and G-G.

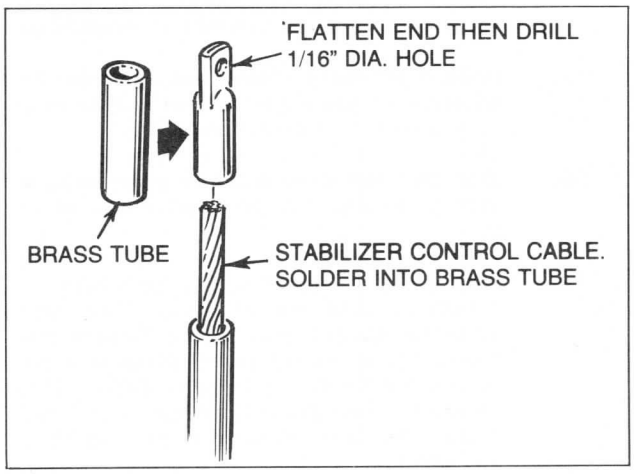
4. Drill LEFT fuse side for rudder control tube exit as shown, glue tube in place to inside of left side all the way to F-5 (about every 1") - set aside.

5. Build basic fin frame directly over plans using 3/16" x 3/16" outside frame stock. Remove from plans; lightly sand flat.



6. Glue RIGHT fin sheet part T-1 accurately in place, as shown on fin drawing. Glue rear 3/16" Sq. pivot block in place. Glue RIGHT side 1/32" x 3/16" fin frame cap stock in place; lightly sand flat. Glue fin in place to RIGHT fuselage side, over plans.

7. Solder drive fitting to cable end. Use 3/16" x 3/16" block to hold cable tube. Glue block in place to RIGHT T-1, just below cutout. Insert cable into tube and use a heat gun to bend tubing and cable to fit within right fuse side. Once bend has been made, glue tube to right fuse side up to F-5 location about every inch.



Install antenna tube to right side (sections E-E and F-F).

8. Notch F-5 to accept rudder, elevator, and antenna tubes. Notch F-4 to accept rudder and elevator tubes.

9. Mark rear pivot hole location onto LEFT T-1 side. Use a punch (nail, etc.) to open this hole enough so that later sanding won't remove it. Glue LEFT T-1 sheet in place. Use the 1/32" x 3/16" stock to cap the left side of the fin. Lightly sand flat.

10. Lay the LEFT fuselage side over the RIGHT fuselage side/fin assembly. Check fit. Sides should match. Glue LEFT fuse side to RIGHT fuse side from 1" forward of the fin, back to the end of the fuselage - weight or pin and allow to dry.

11. Spread fuse sides and glue F-5 in place - keep square (5-minute epoxy allows a bit more positioning time. Glue F-4 in place; keep square.

12. Glue rear 1/8" ply screw plate in place against F-5 fuse sides and against bottoms of F-2.

13. Epoxy F-3 in place.

14. Trial-fit motor. With the **ASTRO FLIGHT** Cobalt 035, rotate motor as far as it will go to the right (this minimizes the height of the brush housings). Note that the bottom brush housing will contact the

bottom left triangular stock. Mark with a pencil where this occurs and use a **DREMEL** to relieve this area. Once the motor is in place, drill two 1/8" diameter holes in F-3 for mounting with two 4-40 x 1/2" screws. Remove motor and screws - set aside.

Note: For a **MABUCHI** 380 motor, no special rotating is required, but metric mounting screws are needed (not supplied).

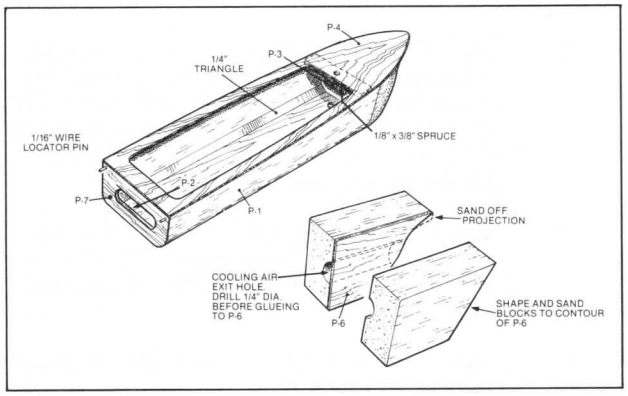
15. Using 1/16" balsa sheet stock, glue bottom sheeting in place (cross-grain) from rear of F-4 back to end of fuse sides.

16. Glue 1/8" pod screw plate in place between 1/8" fuse longerons and against rear of F-5.

17. Tack glue die-cut P-4 ply pod base to bottom of fuse sheeting with front edge securely against F-4. Glue forward pod former P-2 carefully to P-4 (Keep glue off of F-4 and be sure to center P-2). Glue triangular 1/4" stock to bottoms of P-1 pod sides - be sure you make a LEFT and RIGHT pod side!

18. As shown on the plans the pod is held in place at the front with two 5/8" lengths of 1/16" music wire. The two required holes for their locating/mounting pins must now be drilled through P-2 and F-4. Drill 1/16" holes. Insert the two 1/16" x 1-1/2" music wire pins in place and glue securely to the P-4 pod base and P-2 former.

19. Now glue the P-1 pod sides in place to P-2/P-4 making sure the P-1's match the fuselage sides. Make certain to keep glue off of fuse sides. See drawing below.



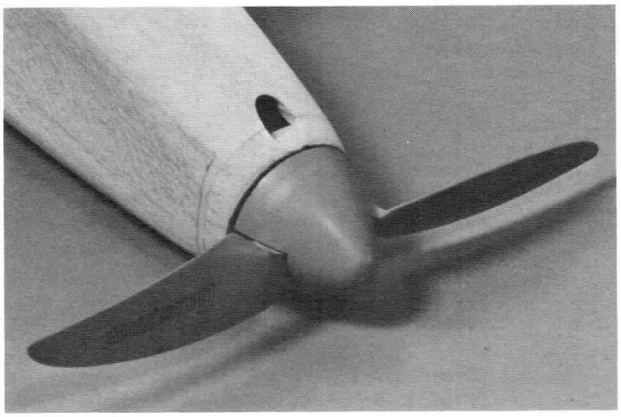
20. Glue 1/8" x 3/8" spruce/ply to bottom of P-4 and butt up to P-3.

21. Fit and glue P-6 and pod tail blocks in place. Drill cooling air outlet holes and sand bottom of pod to accept P-5.

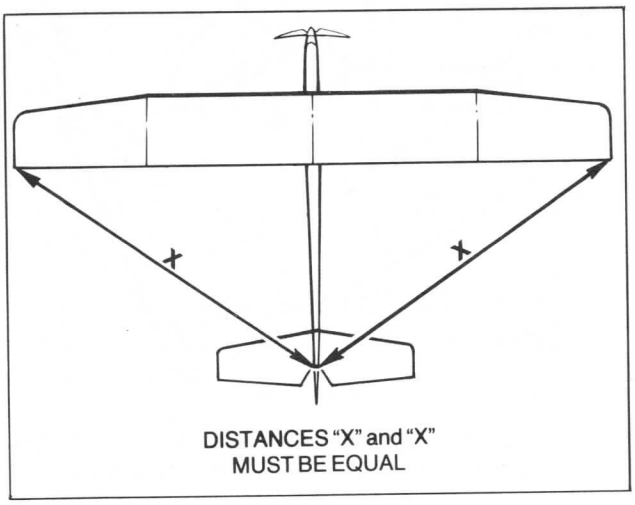
22. Now drill and tap pod screw plate with an 8-32 tap. Glue P-5 in place. Locate the 1/2"x 2" x 12" length of balsa. Using a sanding block, bevel-sand one end of the block to fit against the forward face of F-4, holding it in place at the top of the fuselage.

23. The forward end of the radio hatch is now cut at the angle shown on the plans. Once the bevel cut has been made, use the sanding block to lightly clean up each end of the cut. Set aside the hatch part for a moment. On the remaining length of block measure forward from the bevel cut and cut this piece off. This then becomes the forward "lip" for the radio hatch. Use tape to hold the radio hatch in place to the top of the fuselage, against F-4. Apply a small amount of glue to the bottom of the forward block and glue it in place to the top of the fuselage and nose block, matching the bevel on the front of the radio hatch block, thus insuring a nice fit between these two blocks. Untape and remove the radio hatch block. Locate and remove the ply hatch "lip" from its die-cut sheet. F-4 can now be glued to the forward, bottom surface of the hatch block with 3/16" of its forward end protruding, thus providing a fit beneath the forward block just installed and preventing shifting from side-to-side. Install the two 1/8" square hatch locators. Repeat procedure for the bottom nose block. The bottom block, not being removable, can now be glued in place.

24. The next step is to assemble the nose block. Glue the plywood spinner ring to the 1/4"x 1-3/4" x 2" balsa nose block, carefully centering it. After the block has dried, remove center section by cutting along center of spinner ring with a #11 blade. Sand the front of the fuselage per section B-B to accept the nose block assembly. Align the nose block with the motor shaft and cement to F-3. The cool-air intake hole can be drilled at this time (see photo below).



25. Now trial-fit your wing to the fuselage. Make sure the wing is centered and that the leading edge is up against F-4. Holding these two structures together, observe the fit between the bottom of the wing and the wing saddle area. It may be necessary to slightly bevel the tops of the fuselage sides and F-1 doublers to get a snug fit; do this now. Once satisfied with the wing/fuselage fit, you're ready to make the hold-down system. Again place the wing on the fuselage and use weights to hold it firmly in position. Make sure that the wing is squarely in position on the fuselage by taking wingtip-to-tailpost measurements as shown in the figure below ("X" should equal "X").



Locate the 3/16" dia. dowel from the parts bag. A 3/16" dia. hole must now be drilled through F-4 (see mark) and into the wing's center W-1 ribs, to a depth of 1-7/8," measured from the front face of F-4. Mark this depth on your drill bit with a strip of tape. Once the hole is drilled, remove the wing from the fuselage and trial-fit the 3/16" dia. dowel in place. Use sandpaper to slightly round the front edge of the dowel. Now glue the dowel in place in the wing (clean off any oozing glue). Once dry, again fit the wing to the fuselage and use weights to hold it in place. The rear nylon screw hold-down system is now made. Start by drilling a hole, with a #29 drill bit, through the wing's trailing edge and through the 1/8" ply wing screw plate at a slightly forward angle (see plans). Remove the wing from the fuselage. Enlarge the hole in the wing's trailing edge to allow the 8-32 nylon screw to slip through to the head. Now using either an 8-32 tap or an 8-32 screw (metal), tap the threads into the hole made in the ply wingscrew plate. Once the threads have been cut, give them a very thin coat of instant CA glue and again run the tap through them. This toughens the threads in the plywood. Re-fit the wing to the fuselage and screw it in place to again check the fit. Note that about 7/8" of the length of the nylon screw (1-1/2" supplied) can be trimmed off.

26. Remember that 1/2" length of 1/16" I.D. aluminum tubing that you saved back when building the stabilator? Locate it now. With a 3/32" drill bit, finish the hole through the fin (the stab pivot hole). Cut a 1/4" length of aluminum tubing, clean each end with a #11 blade and carefully insert it into the stab pivot hole just cleared out; do not glue. Attach the stabilator halves to the fin; just press in place for now. What we're going to check for now is alignment. We want to view the airplane head-on at a bit of a distance. Place it on a table, facing you, and back-off a few paces, sighting directly at the front. Is the wing sitting properly on the fuselage? Is the stabilator tilted in relationship to the wing/fuselage or does it line-up right? If everything else seems to line-up, we can proceed to finish sheeting the top, rear of the fuselage. If it doesn't, we need to know which way to twist the fin to make everything line-up properly because once the top, rear sheeting is installed, it "locks" the fuselage firmly in place thus making any such corrections extremely difficult, if not impossible.

27. If the alignment appears to be OK, remove the stabilator halves, leave the wing in place, and carefully cut and glue the 1/16" balsa sheet (applied cross-grain, as shown) top, rear decking in place back to the leading edge of the fin. However, if some alignment is needed by having to pull the top of the fin left or right, now is the time to do it, before applying the top, rear sheeting. This is how it's done. Set the assembled airplane on a large, flat table. Weight the top of the wing center section to hold it firmly in place. Again, sighting directly at the front of the model, determine which way the fin has to be tilted. Pull off a long length of masking tape and stick it to the top of the fin. Pull against the tape until the fin is in the right position and stick the other end to the table, thus preventing the fin from shifting. With it now properly aligned, cut, fit and glue the top, rear sheeting in place as earlier described. Let the sheeting dry before removing the masking tape from the fin and you'll find that the fin is now properly aligned. Remove the wing and stabilator halves from

the fuselage. Use your sanding block to now sand the top, rear sheeting and the forward radio hatch and nose block piece flush with the fuselage sides. You can also now sand the top forward hatch and nose-block contours to shape as shown in the plans, no need to round corners yet.

28. From your parts bag, locate the 1/4" shaped fin/fuselage fairing. Use your sanding block to adjust the angles if needed and glue in place. As shown, this is now trimmed to fair the fin leading edge into the top, rear of the fuselage.

29. Finally, push the 1/4" length of aluminum tubing that's in the rear pivot hole about halfway out, apply just a bit of adhesive to its outer surface (5-minute epoxy or slow-cure CA) and push it back in place in the fin.

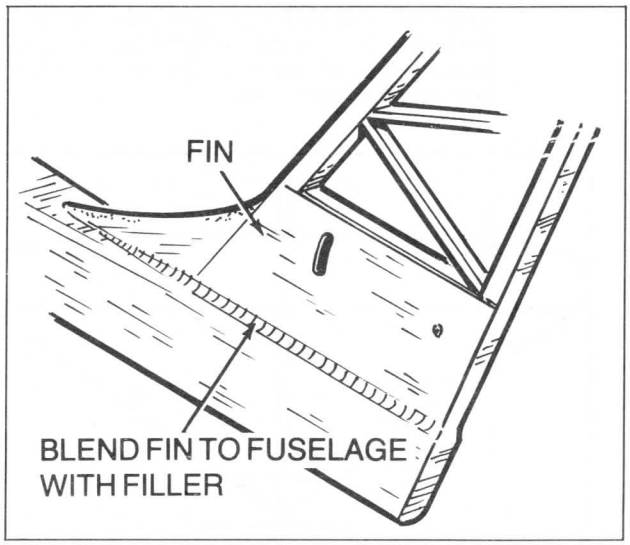
30. With the exception of contouring and final sanding, your fuselage should be complete.

XI. FINAL ASSEMBLY

It's often been said that the difference between a good model and a great one is sandpaper and the willingness and ability to use it. This point in construction can literally make or break the performance and the look of your model. Since the PHASOAR is an obvious candidate for use of MonoKote, keep in mind that the surface preparation of the wood will dictate the finished, covered look of your model. Referenced use of "filler" in the following text, refers to products such as MicroFill, Model Magic Filler, or something similar. These products dry quickly, are very light, and MonoKote goes over them nicely.

Let's start with the fuselage, since the other components should, by now, be sanded and about ready to use.

1. Note the lower left corner of Cross Section F-F on the plans. This demonstrates about the correct amount of radius that can and should be sanded into the fuselage bottom. As this sanding radius moves aft, toward the fin post, and the fuselage diminishes in width, the result will be a pleasant looking oval shape. Next, sand the radio hatch and nose sections. Use a rougher grit of paper at first, followed by the finer #220 to do the job nicely. The last section to tackle is the top, rear of the fuselage - back and including the fin fairing and fin leading edge. Take every effort needed to sand this structure to the point that it looks and feels like one piece. You will note that where the T-1 fin sides meet the fuselage sides, there is a disparity in wood thickness resulting in a kind of "lip." On our prototypes we handled this by sticking a length of masking tape lengthwise about 3/16" above this joint, on T-1. Then we carefully sanded down the fuselage side(s) to as close to T-1 as possible (the masking tape was there to protect T-1 in case we got too close). Then with the tape still in place, we used filler to "fair-in" this joint, feathering the material carefully. When the filler was dry, the tape was removed and we used very light sandpaper to finish feathering the joint.



2. Use your sanding block to sand the trailing edge of the fin flat and straight.

3. The last step in preparing the fuselage for covering is to sand the fin/rudder combination together, as a single unit. Start by using masking tape to accurately position the rudder to the fin. Now use your sanding block to accurately match the side view shape of the rudder to the fin/fuselage. Once that's done, remove one of the pieces of tape from one side only and lay the structure down on a flat surface - taped side down. Use your sanding block to now sand the rudder's cross-section shape into the fin/fuselage, but only about halfway. Add another piece of tape to the now sanded side, flip the structure over, remove the tape and repeat the sanding operation. After a couple of passes on each side, you should be about where you want to be; a fin with a true leading edge and a rudder with a true trailing edge and everything in between accurately matched. The leading edge of the rudder can now be beveled as shown on the plans, thus facilitating left and right movement when hinged with MonoKote.
Once this is done, locate and remove the 1/32" ply rudder horn from its die-cut

sheet. Once again tape the rudder to the fin, right side only. Use a sharp #11 blade to now cut a 1/32" wide slot in the rudder's leading edge, at the bottom, on a plane corresponding to the rudder tube's exit point on the fuselage. Once the slot is made to your satisfaction, trial-fit the horn in place and trim as needed to get a proper fit. Do not glue the horn in place until after the model is covered.

4. Assemble the wing to the fuselage and cinch it down with the wing screw. In this step we want to rough-cut and fit the forward and rear wing/fuselage fairings to the wing's center section. The remaining length of radio hatch block balsa will be used for this. First either carve or use a Dremel tool to route out the bottom mating surface of each of these blocks; cut and fit. Bevet the rear block to match the fuselage (viewed from the side) and then use your #11 blade to carve out a space for F-12 when the block is held in place. Also, the head of the screw will indent the bottom of this block and therefore give you the location to drill a 1/4" dia. hole to allow the screw head to seat against F-12. Once you're satisfied with how the two blocks fit onto the wing and to the fuselage, concentrate on the top view. The forward should be sanded to a sort of half-round shape, carrying through the shape of the hatch block. The rear block gently curves in to the center line of the wing to a point about 1-1/2" from the trailing edge. Glue the blocks in place to the top of the wing while the wing is still attached to the fuselage. Protect the wing sheeting around the edges of these blocks with masking tape; sand to a final shape. Use filler to fillet the blocks to the wing. Lightly sand, and you're finished. Remove the wing from the fuselage.

5. Use a sharp razor blade to remove the finished radio hatch block. With the battery/servo compartment now open, install your servo mounting rails. Note on the plans that we've used the remainder of the 1/8" x 3/16" spruce spar stock for these. You may wish to use ply. Install these rails in the approximate positions shown on the plans, with the servo's output arms lined-up with the rudder and elevator tube ends protruding through F-4. With servos in place, cut the 1/4" x 3/8" x 4" spruce micro switch mount to fit as illustrated on the drawing. Drill and attach the two 1/4" x 1/4" x 3/8" maple blocks to the mount with #2 x 3/8 wood screws. Next drill two holes in the mount for the micro switch, and mount with two 2-56 x 1/2" screws and nuts. Set the assembly in position as shown on the drawing. When proper contact is made with switch and servo arm, glue in place. Once satisfied, servos can be removed.

6. Before covering take a few minutes to "ventilate" the various structures; wing, fin (above T-1's), stab halves and the rudder. Ventilating these components allows the heated air (formed when covering) to escape the various sealed compartments (between rib bays, etc.) rather than expanding and "ballooning" the covering.

7. For the wing, use a 3/32" dia. drill bit, hand-held, to drill one hole through each rib, in the center, just behind the spar location. Do this from W-7, at the tip, all the way through the inner-most W-2 rib, beneath the center section sheeting. Using the same bit, drill a hole through the bottom sheeting, just behind the spars on each side of the W-1's.

8. Use a 1/16" dia. drill bit, again hand-held, to now do the same thing to the fin (and also through the 3/16" sq. brace between the tops of the T-1's), rudder and stab halves. On the rudder, drill a small exit hole on the very bottom, behind the horn location. On the stab halves, drill the exit holes through the rear diagonal 3/16" sq. piece.

9. Final-check entire airplane for any flaws or problems. If you find any, fix them now.

10. Since the stabilator halves slip in place using two 1/16" dia. steel pins, there is a need to be able to retain them. This can be done a couple of ways. The first is to simply allow the pins to rust by leaving them outdoors for a night or two. This makes them press-fit into the stab half tubes. Another way is to use a low-tack adhesive (3-M #77 Spray Cement) to coat the wires, thus making them a bit "sticky." In any event, don't permanently glue these in place since eventually the need will arise for disassembling the stabilator halves from the fin.

XII. MOTOR/SWITCHES/BATTERY WIRING

CAUTION

FAILURE TO READ, UNDERSTAND, AND THEN FOLLOW THESE INSTRUCTIONS CAN RESULT IN SERIOUS PERSONAL AND/OR PROPERTY DAMAGE TO YOU OR OTHERS!

WHEN OPERATING THE MOTOR:

* ALWAYS wear eye protection!
* KEEP safely away from others!
* ALWAYS make sure the propeller is securely attached to the motor drive shaft!
* REMEMBER to always use the arming switch correctly!
* WARNING:
  Children should never be allowed to operate this equipment without adult supervision!

CAUTION: POTENTIAL BATTERY HAZARD!

The Ni-Cad battery packs used to power the PHASOAR store a great deal of electrical energy. Always be extremely careful to avoid shorting out these batteries. This can lead to a fire, cause burns to you and others and/or, at the very least, ruin the battery pack.

CAUTION: PROPELLER HAZARD!

The suggested motor/battery/propeller components in these instructions result in an extremely powerful system. The arming switch system should be properly notated to provide ON/OFF information. When switched ON, the motor, instantly reaches maximum RPM's and the spinning propeller becomes a hazard to you and others, treat this system with respect! It is very important that you understand all of these precautions and take steps to prevent accidental switching-on of the system. Always unplug and remove the motor battery pack when storing the model or working on it. Always store the model away from small children or anyone else unfamiliar with its correct and safe operation.

REMEMBER: Install and connect the motor battery pack ONLY when the arming switch is in the OFF position and the micro switch is inactive.

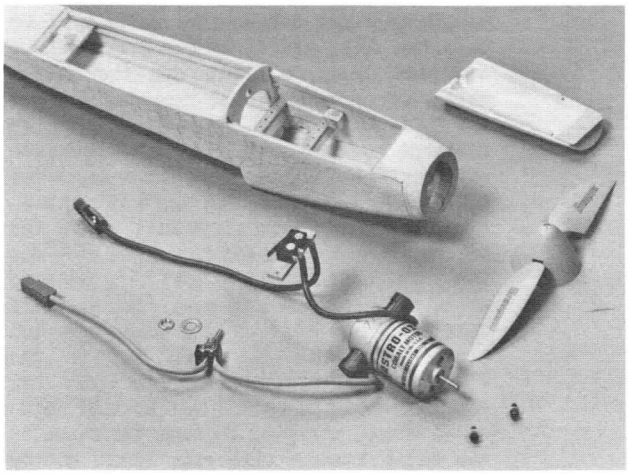
IN ANY OTHER SITUATION, always disconnect and remove the battery pack, especially when working on the model and transporting or storing it.

FUSES

In the following instructions there is a straightforward wiring diagram which also includes a notation concerning the location of a 15 to 20 amp fuse. A fused electrical system offers some real safety to its overall operation. Should the motor stall, as in the case of the propeller being stopped due to striking an object, the battery pack will surge its current output and blow the fuse, thus preventing motor and/or battery pack damage or burn out.

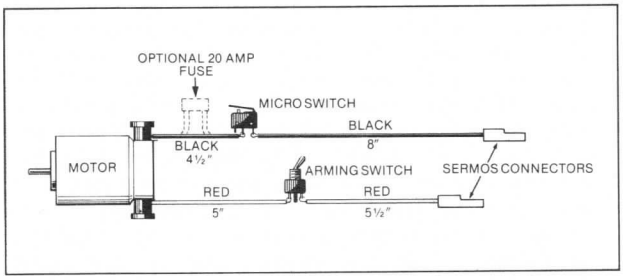
WIRING

These instructions concern the required wiring when using the **ASTRO FLIGHT** 035 Cobalt motor. The components of this system (as shown below) are:



* 10-1/2" of Red (positive, +) hi-flex, hi-strand count wire (we've used both **ROBART** and **SR** wire with good results).
* 12-1/2" of Black (negative, -) wire.
* Micro switch (Subminiature SPDT Lever Switch) made by **ARCHER** and sold through **RADIO SHACK** stores - Catalog No. 275-016.
* Arming switch (Subminiature SPST Toggle Switch) made by **ARCHER** and a **RADIO SHACK** item - Catalog No. 275-612.
* 1 Package of **SERMOS** R/C CONNECTORS (contains four connectors, 2 red and 2 black).
* Soldering Iron or Gun (about 42 watts).
* Flux and solder.
* Small 15-20 amp fuse with solderable holder.

1. The **ASTRO FLIGHT** 035 cobalt motor comes already pre-wired with a **Tamiya**-type connector and an RF choke soldered in place. Start by un-soldering the black wire from its post connector, leaving the RF choke joint still in place.



Referring to the diagram above, cut a 4-1/2" length of hi-flex wire and use a razor to remove about 1/4" of the sheathing from one end. Bend the solder tab straight out from the post on the motor. Now solder the wire to the tab with the length of the wire pointed forward, towards the front of the motor. Bend the solder tab back down again. Cut this wire in half, remove the sheathing from each end and solder the fuse/holder in place. The remaining end of this length of wire is now soldered, in place to the center solder tab on the micro switch, with the wire in place straight down, in relationship to the switch.

2. The remaining length of black (-) wire (should be 8") is now prepared by first removing 1/4" of the sheathing from each end. Now solder the **SERMOS** connector clip to one end and insert and snap the black connector in place. The other end of the wire is now soldered in place (wire pointing straight down from the switch) to the far left solder tab of the micro switch. This completes the negative side wiring.

3. Now un-solder the remaining red wire on the motor's solder tab, again leaving the RF choke connection in place. Cut a 5" length of red hi-flex wire and remove 1/4" of the sheathing from each end. Solder one end of this wire to the motor's solder tab with the length of the wire pointing forward toward the front of the motor. Bend the tab back down. Solder the remaining end of this wire to the "ON" solder tab of the arming switch. The remaining length of red wire (should be 5-1/2") is now prepared by again removing 1/4" of sheathing from each end. Solder one end into the **SERMOS** connector clip and insert and snap the connector (in this case red) in place. The remaining end of the red wire is now soldered in place to the "OFF" solder tab of the arming switch. Clean and inspect each solder joint, making sure they are each secure. Applying a small amount of silicon adhesive to each of these joints further avoids any shorting.

4. The wiring system and switch array should now be tested. Assuming that your battery pack has been equipped with **SERMOS** connectors, connect the pack to their appropriate leads. Hold the motor firmly in your hand (WITHOUT A PROP IN PLACE) and "blip" the micro switch with the arming switch in the ON position. If nothing happens (highly unlikely), your battery pack is either totally dead (discharged) or you have a cold solder joint somewhere. Now is the time to again check all of these connections to ensure proper operation every time, on demand.

XIII. COVERING

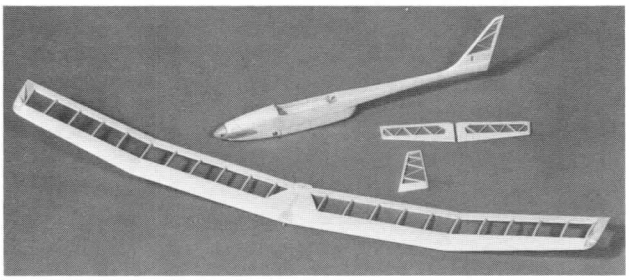
In every aspect of these instructions thus far, we've stressed the importance of paying attention to weight. At this point in the construction of your PHASOAR, you should have an amazingly light model. In keeping with this attention to weight, it is extremely important that you cover your PHASOAR with MonoKote. MonoKote will provide your PHASOAR with comparatively little weight gain, an incredibly brilliant finish and most importantly--airframe strength!

Realistically, one 6' roll of MonoKote, properly cut-up and applied would do the job, providing you would settle for a mono-chromatic color scheme. However, you may consider a multi-colored scheme that is at once visible in the air and looks great in the pit area, too! Now is the time to choose your favorite MonoKote color combination.

MonoKote is easiest to apply and work with when you have the appropriate tools at hand to do the job.

Shown in the photo above is a collection of Top Flite tools, the Hot Sock iron shoe cover (a "must" for a great finish), MonoKote Cleaner/Polish, a selection of MonoKote, razor blades (single edge), a hobby knife with a #11 blade and a metal straight-edge (min. 36" long).

The best practice is to cover each of the aircraft's components separately. In the case of the PHASOAR, this means the wing, the fuselage, the battery pod, the stabilator halves and the rudder.



After covering, carefully clear-out any of the required holes, slots, etc., that may have been covered up, i.e., rudder horn slot, stabilator drive ovals, pivot holes, antenna tube exit, and rudder cable drive exit, etc.

On our prototype PHASOAR's we used a small brush and some flat black paint (aircraft dope is fine here) to paint the inside of the air entry hole in the nose and the hole in the rear of the battery pod. This is not necessary, but looks quite nice.

The rudder can now be hinged to the fin using the method shown on the plans. This hinge system provides an extremely efficient rudder action in flight by virtue of the fact that it is gapless. Properly done, these hinges are all but invisible and lend greatly to the overall "one-piece" look of the finished model. Do not install the rudder horn in place yet. This will be done in the RADIO INSTALLATION section of these instructions.

With your covering job now complete, make it really shine by giving it a glistening cleaning job with a few shots of MonoKote Cleaner Polish! About all that's left to do is to add your AMA numbers. REMEMBER that these have to be 1" or taller and must appear on the **RIGHT** wing panel. We have used both Super MonoKote and MonoKote Trim Sheets for this job to make it easy and good-looking.

XIV. RADIO INSTALLATION

Before installing your servos, make sure that they run in the right directions. If you have servo reversing capability, this is a simple task. Install the servos in the fuselage on the rails provided earlier.

From your parts bag, locate the 1-1/2" long, 0.038 I.D. brass tubing. This material will be cut up to provide solder connections between the drive cables and the soft wire paper clip connectors.

Drill a 1/32" dia. hole through the rudder horn to accept the paper clip drive wire. Cut off about 1/4" of the brass tubing connector material and clean out each of it with your #11 blade to accept the cable and paper clip ends. Cut off the required length of paper clip wire (see plans) to make the connection to the rudder horn and bend one end into a "Z" bend. Slip the brass connector halfway onto the drive cable end and the paper clip wire into the other end of this connector. Sweat solder the three pieces together, using a minimum of solder. Slip the opposite end of this drive cable into the rudder tube and feed its length through the fuselage and into the servo compartment - don't cut off the excess cable yet. Attach the rudder horn to the "Z" bend and carefully glue the horn into the slot previously provided.

The connections made at the servo ends of the stabilator and rudder drive cables are done in the same manner as described above. However, the paper clip connectors are to be bent with a "V" bend as shown, thus providing some centering adjustments for flight trim.

Install the receiver next. To get the antenna through the fuselage and out the hole previously drilled for this purpose, "fish" a length of heavy thread through the antenna exit hole and into the receiver area. Then use a bit of CA glue to attach the end of the antenna to the end of the thread and pull the thread back out of the antenna hole, along with the antenna.

The battery pack should now be installed, as shown on the plans, and held in place with double-backed tape. The ON/OFF switch can also be held in with double-backed tape. With everything in place, turn the system ON and test for correct movement and centering. Adjust as needed.

The "CG" (Center of Gravity) shown on the plans is exactly where we've flown our prototypes. Balance your model at this point. Interestingly, our prototypes did not require any lead at all to arrive at the CG shown.

XV. FLYING

THE FLYING SITE

Where there is no established local flying site, a large, grassy field can be an ideal area. This field should be free of trees, poles, large obstructions and, especially, high-tension electrical lines. Always fly far removed from houses, populated areas or busy streets. An area approximately two to four times the size of a

regulation football field should provide you with plenty of room, especially when attempting your first few landings!

As we mentioned in the introduction, there is simply no substitute for an experienced R/C pilot to check-out, trim and test-fly your model! This almost always is a guarantee of success. Remember, if you have no experience you NEED an instructor!

PRIOR TO POWERED FLIGHT

First, test-glide your model at least a couple of times.

With the "throttle" stick and also the arming switch in their OFF positions, turn the transmitter ON. Now turn the model's airborne radio ON. Test the controls with the transmitter, once again, to be absolutely sure the controls are moving in the proper direction!

Stand facing into the wind, if any (it's best if there is none), hold the model high above your head in a LEVEL position, with the transmitter in your other hand. Trot or run forward to build up "flight speed." When it feels right, briskly throw the model directly forward (level) at an imaginary point about 100' in front of you. In other words, DO NOT pitch the model into the air in a nose up condition! The model should glide smartly toward that imaginary point without any tendency to veer left or right. If it is turning, correct with SMALL amounts of transmitter input to the opposite side of the turn. If the model wants to pitch up, correct quickly with SMALL amounts of DOWN elevator input and if the model pitches down, correct quickly with SMALL amounts of UP elevator input. Just prior to touch-down, a SMALL amount of UP elevator input can be used to "flare-out" to a smooth landing. Continue this process until you can consistently achieve the required flat, smooth glide. Take your time here to get comfortable with this phase of your model's regime because ultimately the glide will constitute the bulk of its flying time.

POWERED FLIGHT

This is it! The pay-off for the work done thus far! Just as you did before in the test-gliding phase, activate the required switches in this order:

1. Transmitter switch **ON** with throttle stick down in the **OFF** position.
2. Make sure arming switch is **OFF**.
3. Turn airborne radio system **ON**.
4. **NOW** turn arming switch **ON**.

Again, test the FLIGHT CONTROLS of your model with transmitter input to each. Holding the model away from you (and others) move the throttle stick up briefly to test the motor and then turn it off. Just as you did in the test-gliding phase, hold the model high over your head, level or nose slightly down, pointing to that imaginary point 100' ahead of you and directly into the wind. With the transmitter in your other hand, move the throttle stick up to the ON position and trot or run forward. When it feels right, smoothly throw the model forward, wings level, toward that imaginary point. Immediately take the transmitter in both hands for control.

Typically, the PHASOAR will quickly get into "step" and start an aggressive climb that will only need momentary SMALL inputs of DOWN elevator to control. Keep the model climbing out, into the wind and away from you until it is about 400' away. At this point, the model will be quite high and you can start a slow 180 degree turn back toward you, still allowing the model to climb out. Before it gets back to you, do another 180 degree turn. Repeat this process until comfortable altitude is reached (with our prototypes, uncomfortable altitude...too high...was reached in less than 55 seconds). Move the throttle stick to the down or OFF position and let the model transition into glide mode. This first flight is for experience purposes only and not dedicated thermal hunting so don't be concerned about looking for lift right now, unless you're totally comfortable doing so.

With the PHASOAR now in un-powered glide, familiarize yourself with each of the controls. REMEMBER: This design is a powered sailplane, not a pattern ship. Save the aerobatics for a different design! Check for stall characteristics, both upwind and downwind, by simply establishing a heading and slowly pulling back on the elevator stick. What should happen is nothing more exciting than a nose-high attitude, followed by a nose-down pitch with almost immediate recovery. If the model wants to fall off briskly to one side or the other (a "tip stall"), you are going to want to impart a little "washout" to each outboard wing panel when you get home. Do this by twisting the wingtip to raise the trailing edge slightly (1/16 to 1/8"), and then reshrink the MonoKote to maintain the new position.

As your model gets down to 100-200' of altitude, turn it into the wind and move the throttle stick up to the ON position and power your way back up to comfortable altitude and again shut down the motor.

LANDING

Land the PHASOAR by letting it glide smoothly forward (very little, if any, elevator inputs) in a pre-determined and large rectangular pattern which terminates with the model pointing directly into the wind, passing safely in front of you at an altitude of 8' to 10.' At this point, the model is heading away from you with the bulk of the field ahead of it. Keep the wings level and slightly "flare" the model (apply a touch of UP elevator)

just before touchdown. Wind conditions can profoundly influence flying and landing characteristics. It is strongly suggested that you do not fly this model in any wind above 5 mph until you are totally comfortable in controlling it! The PHASOAR has performed well in very stiff breezes BUT only in the hands of very experienced and competent R/C pilots. DO NOT EXCEED YOUR EXPERIENCE AND/OR LIMITATIONS!

Take it easy and have fun!

XVI. KIT SPECIFICATIONS

The final specs on our prototypes turned out as follows:

Wingspan	56 1/4"
Wing Area	335 sq. in.
Weight	24 to 27 oz.
Aspect Ratio	9.9 : 1
Overall Length	32"

BILL OF MATERIALS

TOP FLITE MODELS
PHASOAR 035

Kit Part No.	Computer No.	Description		Qty/ Kit
	390005	Wood Bundle #1 of 2		1
RC-38- 1	312019	D/C Balsa	Fuse sides	2
2	312010	D/C Balsa	Wing ribs	2
3	312020	D/C Balsa	Fuse/Wing/Pod	1
4	312021	D/C Balsa	Fin/Rudder	1
5	710114	D/C Plywood	Fuse/Pod/Wing	1
6	312023	D/C Balsa	Stab Caps	2
7	312024	D/C Balsa	Fuse (F-2)	1
8	511063	Balsa Sheets	Wing/Fuse	5
59	312030	Balsa Sheet	Fuse Nose	1
	390006	Wood Bundle #2 of 2		1
		Contains assorted balsa and spruce, braided cable and plastic tubes. All are rolled inside the plan sheet.		
		Separate Wood parts		
RC-38-21	710115	D/C Plywood	Fuse Former	1
22	710116	D/C Plywood	Motor Mount	1
23	312022	Shaped Balsa	Pod Blocks	2
24	312028	Shaped Balsa	Fuse Nose	1
25	312029	Shaped Balsa	Hatch/Bottom Fuse	1
	380004	Poly Bag #1 of 1		1
		Miscellaneous small wood parts. Also, screws, nuts, tubing, and wire.		
RC-38-20	150026	Plan sheet		1
RC-38-41	150027	RC-38 Instruction Manual		1