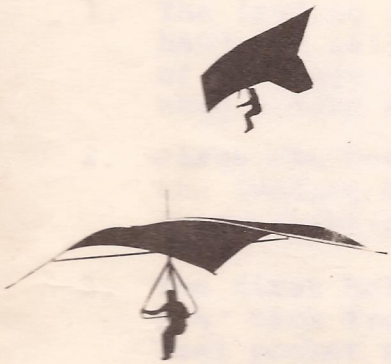
FLYING



"Category One" refers to hang glider flights downhill, using shallow banked turns of not more than 90 degrees without any intended excursions above half the wing span. Half the wing span height approximates the point at which ground cushion is no longer felt by the experienced self-soarer.

The dream of self-soaring like a bird is certainly with us, but the achievement of this flight for man is sometimes of short duration and confusing, just as it must be for a learning bird. If we are to realize the dream, it seems best that we copy the bird in those areas which are applicable. But since the bird's equipment grows, and we build and strap ours on, maybe our first efforts should be to understand a little about what happens when we put our hang glider wing into flight.

To a layman, control is not initially confusing anymore than balancing while walking or while riding a bicycle is confusing. Describing why and what actually happens is. This will be a little basic for the licensed pilot, but follow me through, for some rather startling things happen as a result of a hang glider's slow speed and small momentum.

BASIC CONTROL

The first method we tackle is simple and is definitive of the form of self-soaring called "hang gliding." You simply move your body, to shift the center of gravity of the flight system, in the direction you wish to go. Further, body forward is nose down; body back is nose up. That's how it feels. But if you were watching from behind, you would see that the body's inertia makes the body act as a plumb bob, and it is the wing that actually does the moving.

Then as the wing pulls you into the turn, centrifugal force swings your body off plumb and further increases the bank. If you maintain the same position in relationship to the control bar, even further banking ensues. The tighter the turn, the more centrifugal force you create and the greater the bank. Pushing back to tighten the turn creates more centrifugal force and increases the bank.

This method of control is basically an over-control, for it requires constant small reversing movements to achieve the desired final result.

Encountering an increasing velocity of the wind during low airspeed cross wind turns, blows you into and has the effect of tightening the turn, thus increasing the centrifugal force, which swings your body out, increasing the bank; this tightens the turn, etc., until you stall and the wing now slips down inside the turn. This is a situation to be avoided, for you are now descending rapidly and proceeding parallel or into the hill. A hard impact is to be expected.

On the pitch axis something similar occurs when encountering a large increase in wind speed. At the now increased airspeed, the wing experiences increased lift and drag. Being pitch stable, the wing increases its angle of attack (pitches up), for it now has more lift than weight. The increased drag causes the aircraft to decelerate and the body's inertia causes it to swing forward. Without corrective body movement, the wing is forced further nose up, causing more deceleration, swinging the body further forward and thus adding more nose up, etc. . . . In extreme cases you can end up inverted. The extreme in this case would be a wind speed increase to somewhere near your terminal velocity (max. diving speed).

In most cases, the fix is to beat it to the punch by forcing the body forward and breaking the cycle. In both cases, forcing your body forward early or far enough will break the cycle, but that extreme amount of body-forward required is not always available late in the cycle and does require much more strength than you have normally used in previous normal control movements.

Moving the body forward in a bank, stops the turn by reducing the lift through reduction of the angle of attack. Gravity, acting on the body's offset moment arm, then pivots the wing back to less bank. However, considerable slip towards the lower wing will occur, causing a loss of altitude. This problem is not as apparent at higher airspeeds as the normal corrective movement to decrease the bank puts the wing in a light skid out of the turn and lessens the acceleration (centrifugal force) acting to tighten the turn.

Since hang gliders, by inference and definition use this method for all or, at least, a part of their control force, all are also limited to flights in certain types of weather and environmental conditions. Indeed, all aircraft and even the birds are similarly limited. A good simile is the old saying about "weather so bad that even the birds are walking."

So don't be discouraged by this discussion of extremes; their is adequate control for all normal conditions and situations. The word normal implies experience, judgment or the acceptance of someone else's judgment.

But the case is made for the use of augmentative aerodynamic controls which will alleviate the problems and/or widen the envelope of conditions in which you can fly safely.

No matter how anxious you are to "get that thing into the air," instead of just ground skimming, try a little **"WHAT IF? — thinking" — it will help curb that tendency. And good observation of other flights will help answer your "what-ifs?"**

Some of the "what-ifs" were answered in our captive ground-skimming sessions. One was **"WHAT IF I STALL?"** and another was "WHAT IF I AM AFRAID?"

REDUCTION OF FEARS

Planning, training and experience will all reduce one's fears to those that produce safe reactions rather than confusion. And that is what **CATEGORY ONE** training is all about. Continue flying within this category until your training has shaped your responses into a previously conceived and safe pattern, not a confused one.

Observation of your buddy's flight will help you plan your own. Do talk to him about what you saw versus what he intended to do. Many times this will give both of you a better picture of what is happening to the aircraft as it encounters the invisible streams of air flowing up the hill.

The BUDDY SYSTEM is a very positive safety factor except for the urge to competitively compare your performances. Recognize this temptation to each other verbally and stay clear of it!

Training and performance do not and should not go together. Develop judgment and control at the training stage. Look for control rather than performance from your aircraft. Study, understand, plan and master your environment, or it will control you.

TIPS FOR CATEGORY ONE

TAKEOFF

Make your takeoffs definitely into the wind and establish a stable glide path before attempting a turn. Keep most of your first flights straight into the wind.

TURNING

Make your cross wind turns definitely fast (nose down). Turns into the wind can be much slower without chancing loss of control in changing winds. Start with 45-degree turns, and work slowly toward 90-degree turns. Leave downwind work until CATEGORY 2. You need more altitude.

LANDING

Dive into your landings to produce the extra airspeed which will give you the extra time in level flight that produces a good stand-up two-step landing.

HEIGHT OR DISTANCE . . . don't try

Don't try for height or distance. There are many factors that change your performance, that measuring it at this stage in your training is meaningless.

IDEAL SITE

The ideal conditions and site for this type of flying can be described as follows:

WIND: Steady 6 to 10 m.p.h. Time a feather for one second. At 6 m.p.h. a dropped feather will travel 9 feet; at 10 m.p.h. the travel will be 15 feet.

TAKE-OFF AREA: Try to obtain an area that first drops at 15 to 18 degrees, which is just what you would not stumble down when running.

FLIGHT AREA: This slope is such that you could run down it under good control and perform a controlled stop. It is a slope about 10 to 14 degrees. No ditches or fences, please. 150 feet of slope is minimum length.

LANDING AREA: This slope should be less than 8 degrees and free of obstructions. A larger area is preferable because you lack distance judgment and speed control. Always land into the wind. A streamer should be used in the landing area to indicate wind direction. A streamer at the take-off area is also helpful.

In the later stages of the flight, the self-soaring hang glider trainee can vary his rate of descent without gaining or losing speed by over-control. Pitch axis is easiest to vary rapidly and acts like a brake.

FLIGHT CHECKLIST

Do check your wing over before every flight. Make a checklist of those things most likely to incur damage, and those things on which your safety most depends. Above all, resist that urge to hurry. It can get you into trouble.

BEFORE FLYING

Before flying look the slope over for wind conditions and keep track of wind conditions. It only takes a small change of wind direction to adversely affect your flight on some slope.

Please keep those incident reports coming and

"Fly no higher than you are willing to fall."

FINAL ATTACHMENT OF THE SAIL

The positioning of the sail on the airframe is probably the most important step in the assembly of the glider, for this will greatly affect the performance of your glider. The sail is the most critical part of the airplane. All the sails we make are the same, but no two rolls of cloth are, so each sail has its own personality. This is the reason that we do not pre-drill the sail grommet holes.

1. The leading edges and keel have been joined together, and they have the sail loosly attached. Use the drawings to the right of the page for clarification. To attach the sail you will need a hand drill and a 5/32"drill bit.

2. Place the nose and tail of the keel on two chairs, and open the leading edges a couple of feet just to keep the glider frame right-side-up.

3. The first hole to drill is the forward upper keel hole. Measure 5 ½" back from the end of the keel, and hold the edge of the keel pocket at this line. Mark the center of the grommet hole on the keel and drill a 5/32" hole. Use one of the 3/4" sheet metal screws with a washer. The washer has a ¼" hole.

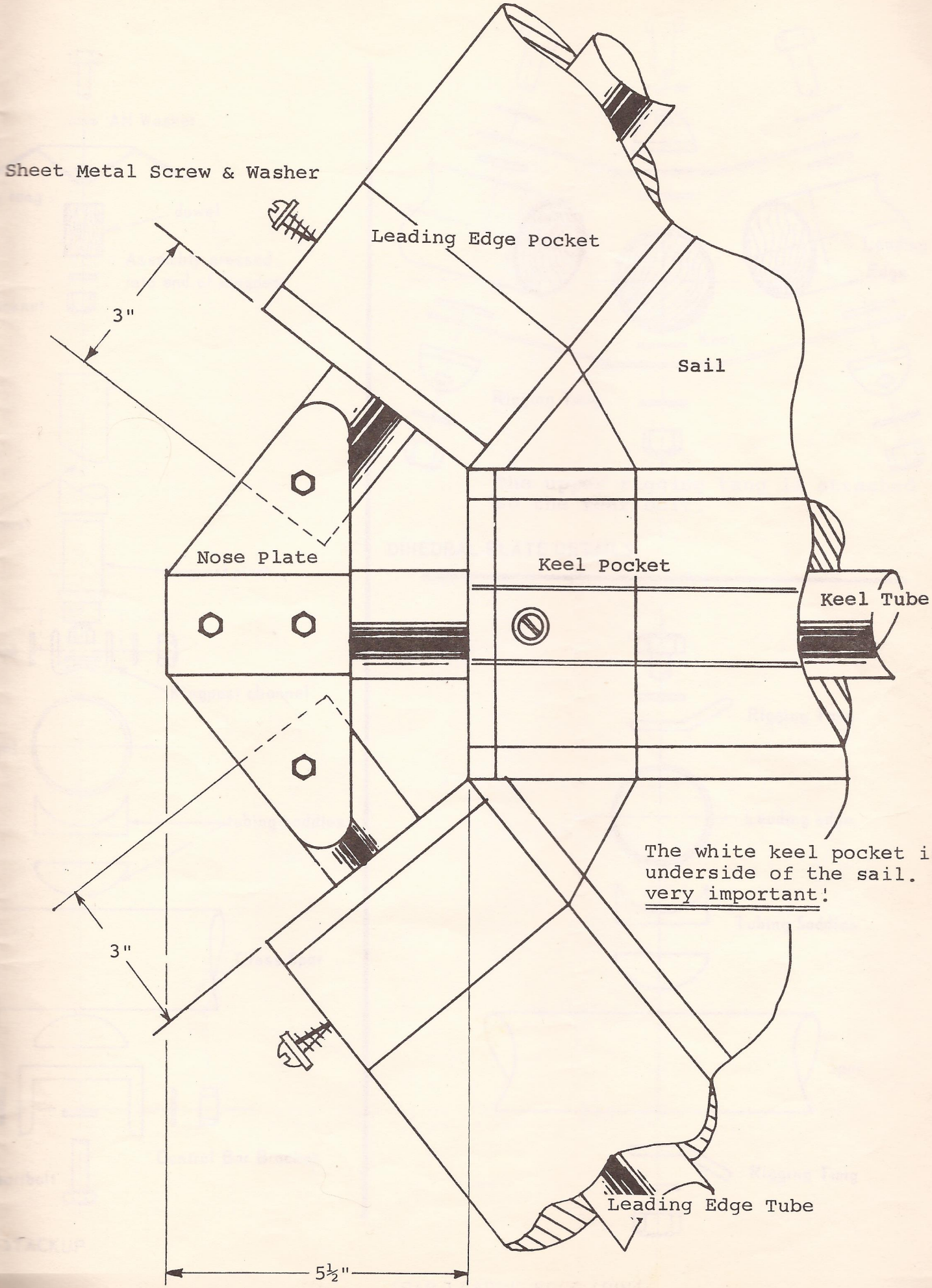
4. Now the rear upper keel hole is drilled. Mark the keel 6 3/4" from the tail end, and stretch the pocket to this line. Mark and drill the grommet hole, and fasten the sail with the same type screw and washer as used in front.

5. The sail is now fastened to the leading edges. To do this the glider must be turned upside down. When the glider is inverted the sail is free to assume the shape it takes in the air. Place the nose and tail of the keel on chairs again. Spread the leading edges open to their flying position. To approximate this use the crossbar as a guide. Place the leading edge tips on chairs also.

6. The leading edge pockets are fastened first at the root. Measure from the end of the tube 3" and position the edge of the pocket there. Follow the same procedure that you used on the keel pocket.

7. The tip of the pocket is secured in the same manner as the pockets. The dimension from the tip of the tube to the tip of the sail is 7½". Be sure that the sail is fastened to the tube at the natural angle that it assumes as it hangs upside down.

8. The final step for sail attachment is to mark and drill the lower front and rear keel pocket holes. These are done using the same procedure as for the others.


Sheet Metal Screw & Washer
Leading Edge Pocket
3"
Sail
Nose Plate
Keel Pocket
Keel Tube
The white keel pocket is on the underside of the sail. This is very important!
3"
Leading Edge Tube
5½"

The SEAGULL III offers the hang glider enthusiast the first aerodynamic improvement in Rogallo Wing design since NASA discontinued its research into the type. The performance and stability of the glider have been greatly improved over standard Rogallos, and we believe it to be the finest Rogallo glider available today. Our stock parts and construction methods are incredibly durable and are designed for the rough use a hang glider usually receives.

You are about to assemble an airplane, and during its construction you should keep that thought foremost in your mind. As an aircraft it should receive all the care and maintenance due any flying machine. There are no hardware store parts found on any aircraft; there should be none on yours. As parts are lost or wear out replace them with Seagull factory parts or genuine AN hardware. Do not take any chances with nuts and bolts that are questionable as to their strength.

An aircraft is only as safe as its pilot, so use good judgement when you fly. Keep us informed about your progress, and send us a photograph.

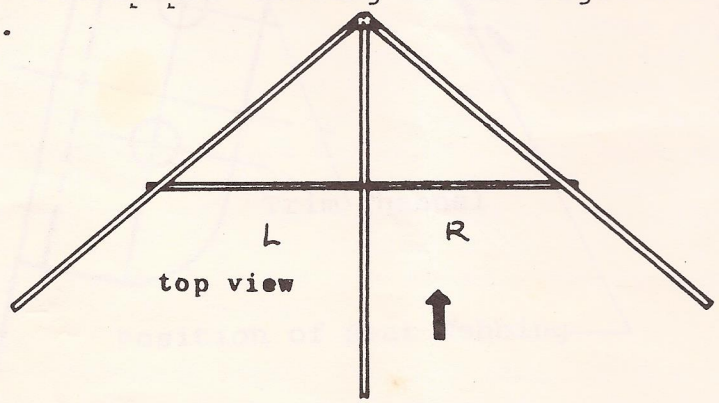
AIRFRAME ASSEMBLY INSTRUCTIONS

1. Inspect all parts for shipping damage or pieces missing.

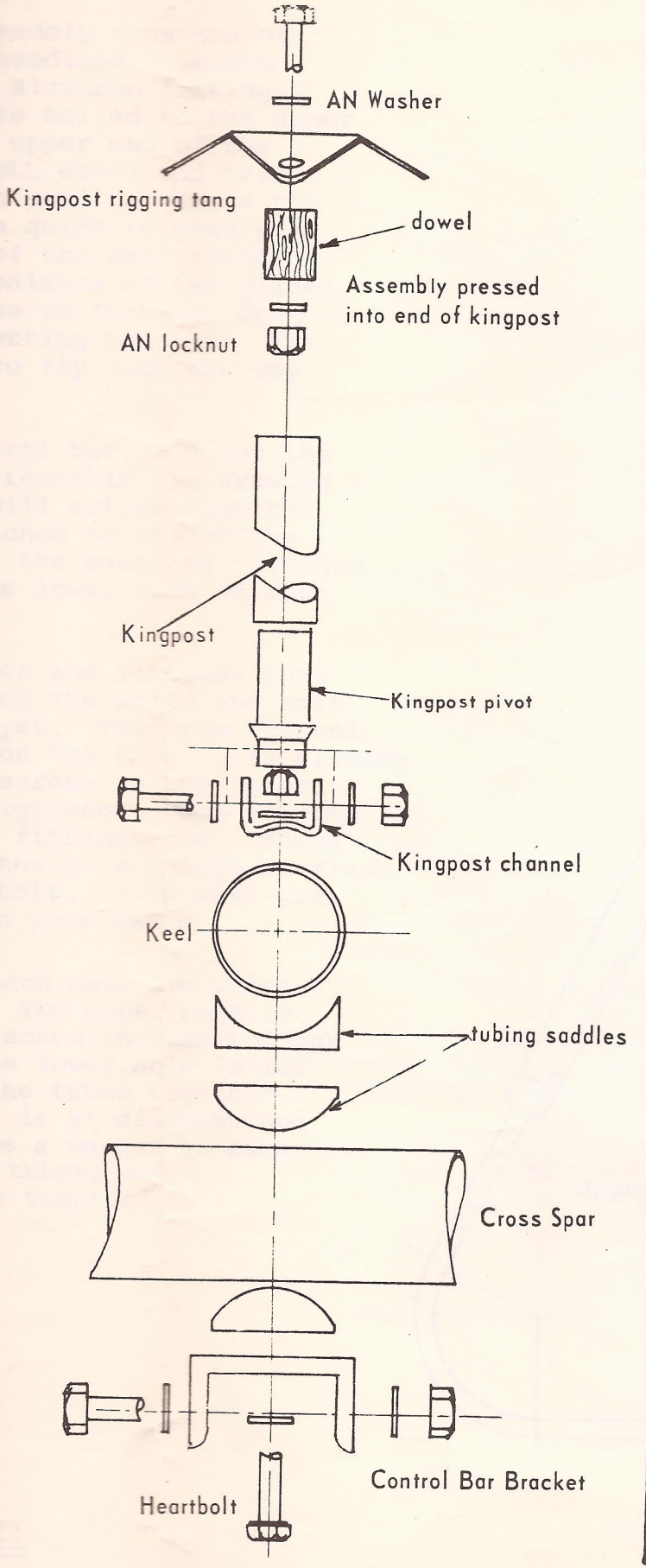
2. Study the drawings in the assembly instructions to familiarize yourself with the glider and its construction.

3. Lay out the keel tube, both leading edges, and the sail. The leading edges are marked right and left. Slide the keel tube into the center pocket. The white pocket will be on the underside of the glider. This is important! Next, slide the leading edges into their respective pockets.

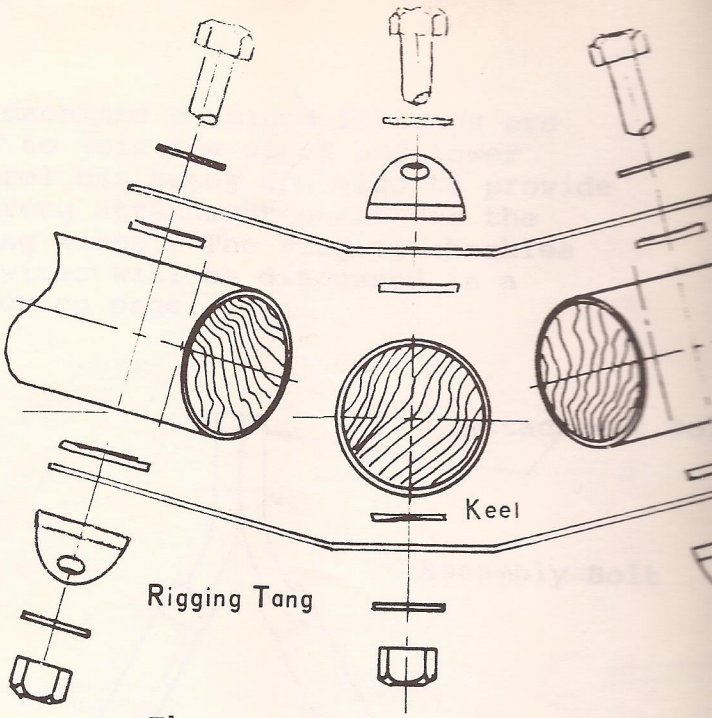
4. Install the bolts through the nose plates on the keel, but do not tighten. The top and bottom plates are different to accomodate the dihedral in the leading edges. They are marked. Follow the drawing to the right and use all the washers.



5. Install the leading edges between the nose plates. This will be easier if the nose of the keel is raised five or six feet above the tail. Do not tighten the bolts yet. The glider is at a very cumbersome and awkward stage of assembly, so take care not to twist or bend the nose plates. If the leading edges are spread open alittle, the keel will not want to twist the nose plates.

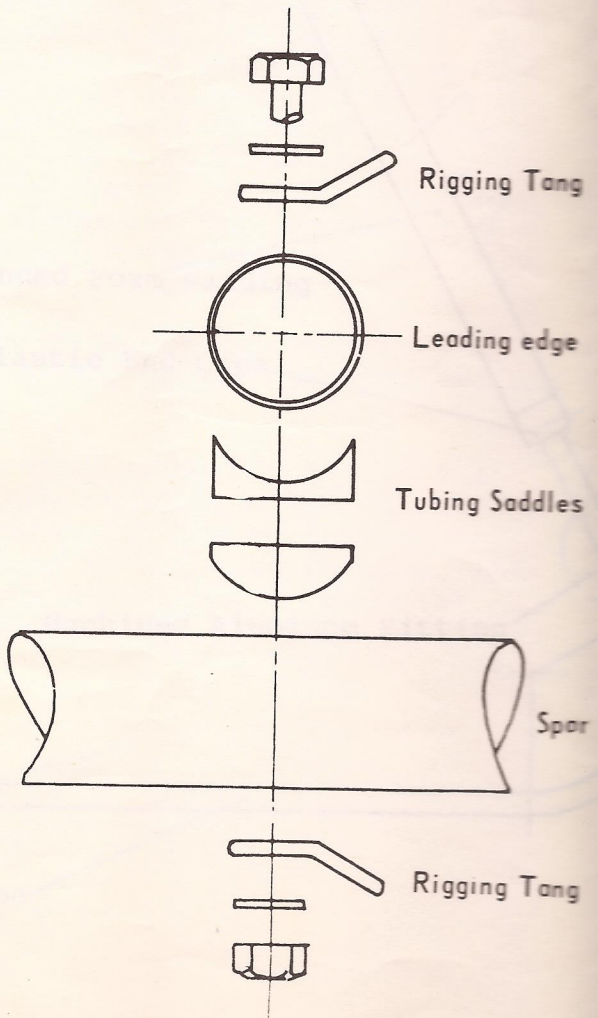


HEARTBOLT STACKUP

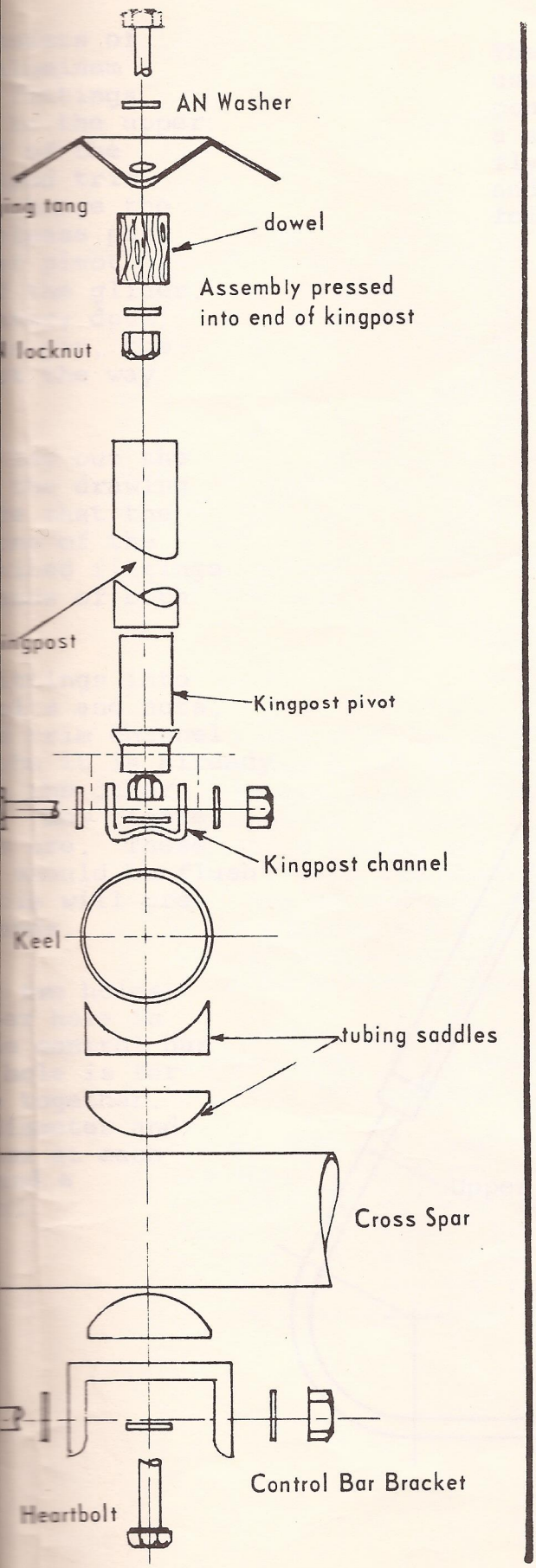


The upper rigging tang is atta
to the rear bolt.

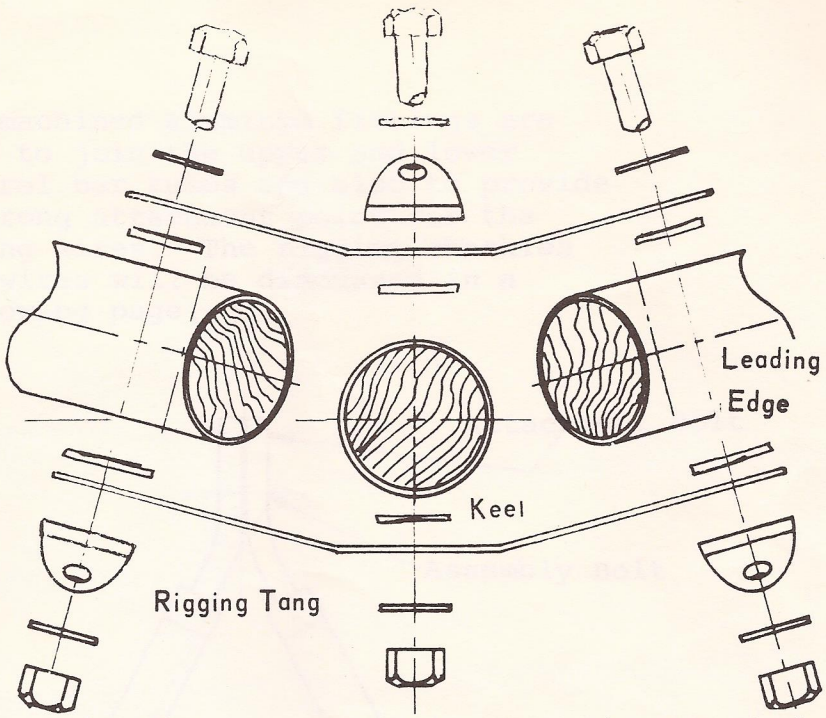
DIHEDRAL PLATE DETAILS



SPAR LEADING EDGE JOINT

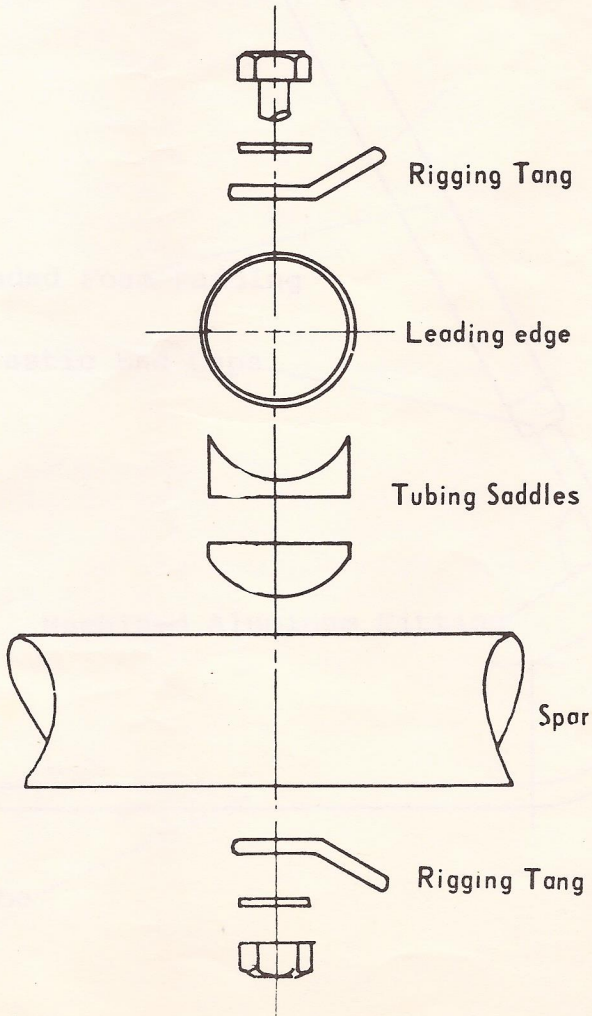


BOLT STACKUP

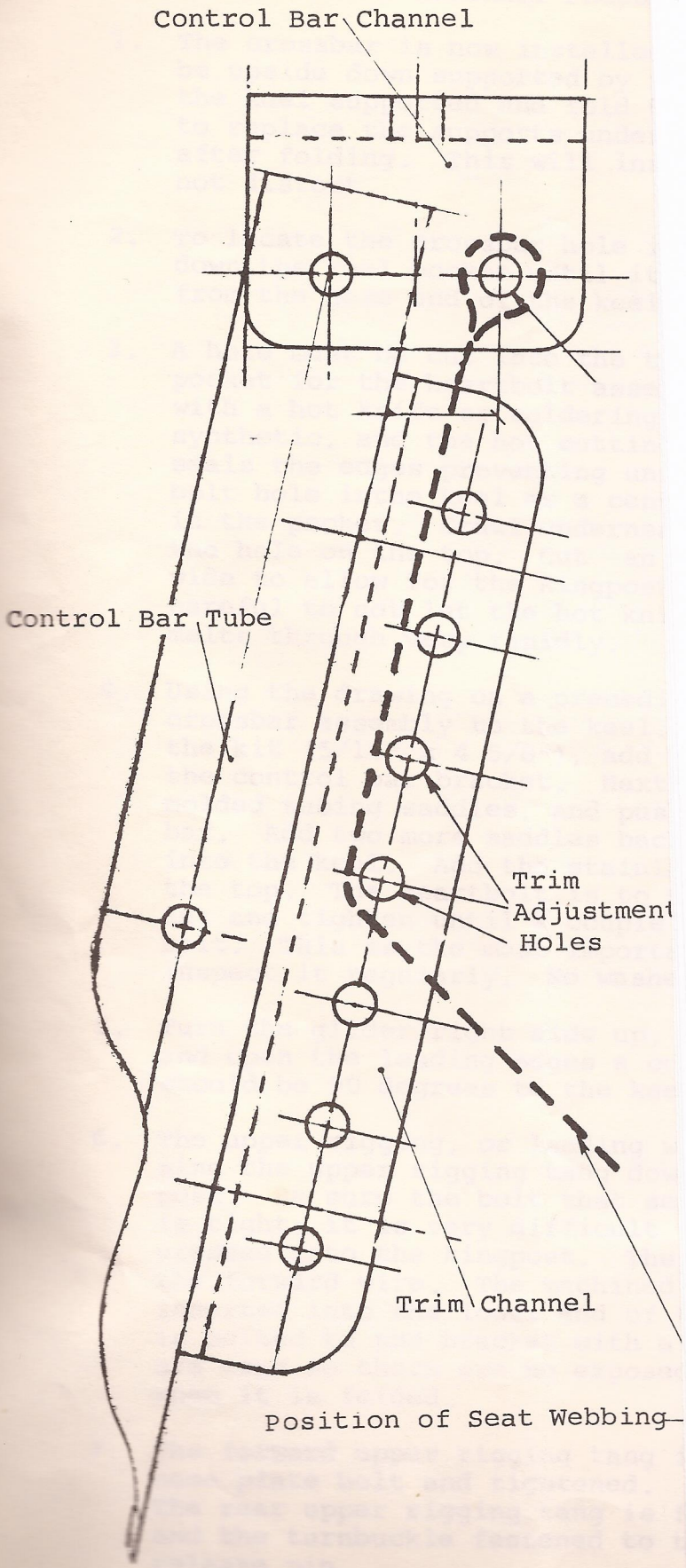


The upper rigging tang is attached to the rear bolt.

DIHEDRAL PLATE DETAILS



SPAR LEADING EDGE JOINT



DO NOT HANG THE

CONTROL BAR ASSEMBLY

The control bar assembly consists of three pieces of black annodized aluminum tubing and two machined aluminum fittings. The machined fittings are bolted to the upper and lower tubes. At the upper end of the control bar is the SEAGULL developed trim channel. This device is used to change the trim of the glider. The quick release pin allows easy adjustment of the seat pivot anglewhich changes the balance of the glider. Move the pin up, the nose is lighter; down, the nose heavier. By setting this pin, the glider can be trimmed to fly just the way you like it.

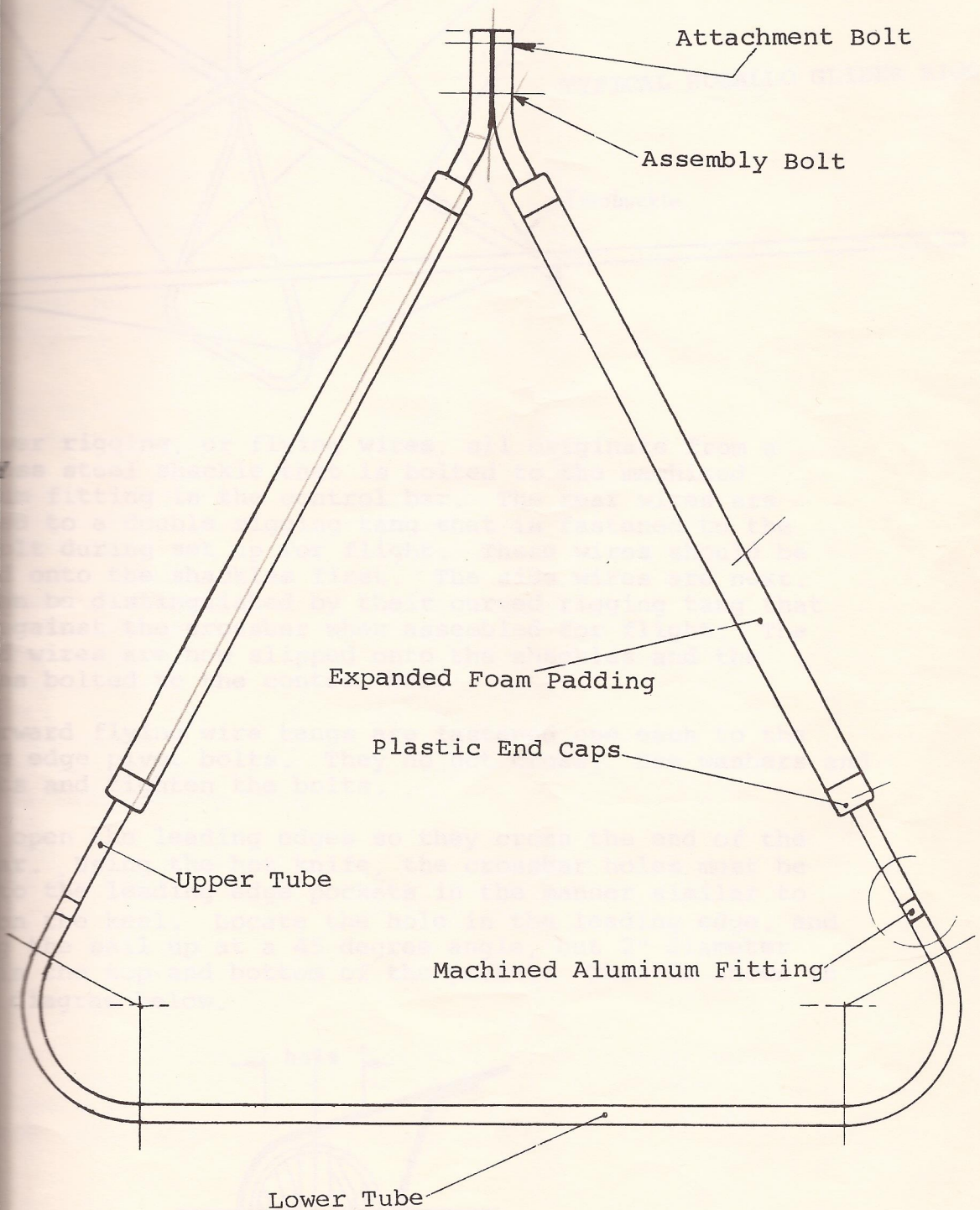
1. To assemble the control bar, lay out the pieces so that they resemble the drawing to the right. You will notice that the trim channel is attached to one of the upper tubes and that the machined fittings are inserted into the lower ends of both tubes.

2. Insert the upper tubes and fittings into the lower tube and add the bolts and nuts. Do not tighten them yet. The trim channel should be tightened on the tube it is already fastened to and the screws on the other side installed and tightened. Now tighten the bolts where the fittings are. These bolts are short and the nuts should be flush with the end of the bolt. This will prevent any scratches on your hands.

3. The two upper tubes each have two holes in their upper ends. The upper hole is for the bolt that attaches the control bar to the glider, and the lower hole is for the bolt that holds the tubes together. Install this bolt; It is ¼" diameter and 2 3/8" in length. Use a washer at each end, one between the tubes, and a locknut. Do not over tighten!

SEAT FROM THE TRIM CHANNEL!!!

The machined aluminum fittings are used to join the upper and lower control bar tubes and also to provide a strong attachment point for the flying wires. The rigging shackles and wires will be discussed in a following page.



FINAL ASSEMBLY PROCEDURE

1. The crossbar is now installed. The glider should still be upside down supported by four chairs or stools. Leave the keel supported and fold the leading edges in. Be sure to replace the supports under the tips of the leading edges after folding. This will insure that the nose plates will not distort.

2. To locate the crossbar hole in the keel, run your hand down the keel pocket until it is felt. It is located 7'3" from the nose end of the keel. Mark its position.

3. A hole must be cut into the top and bottom of the keel pocket for the heartbolt assembly. These holes must be cut with a hot knife or soldering iron. The dacron is a synthetic, and the hot cutting tool melts the cloth and seals the edges preventing unravelling. Using the heart-bolt hole inthe keel as a center, cut a 2" diameter hole in the pocket. Crawl underneath the glider and locate the hole on the top. Cut an oblong hole 3" long and 1 ½" wide to allow for the kingpost bracket. Be especially careful to not let the hot knife touch the sail; the cloth melts through very rapidly.

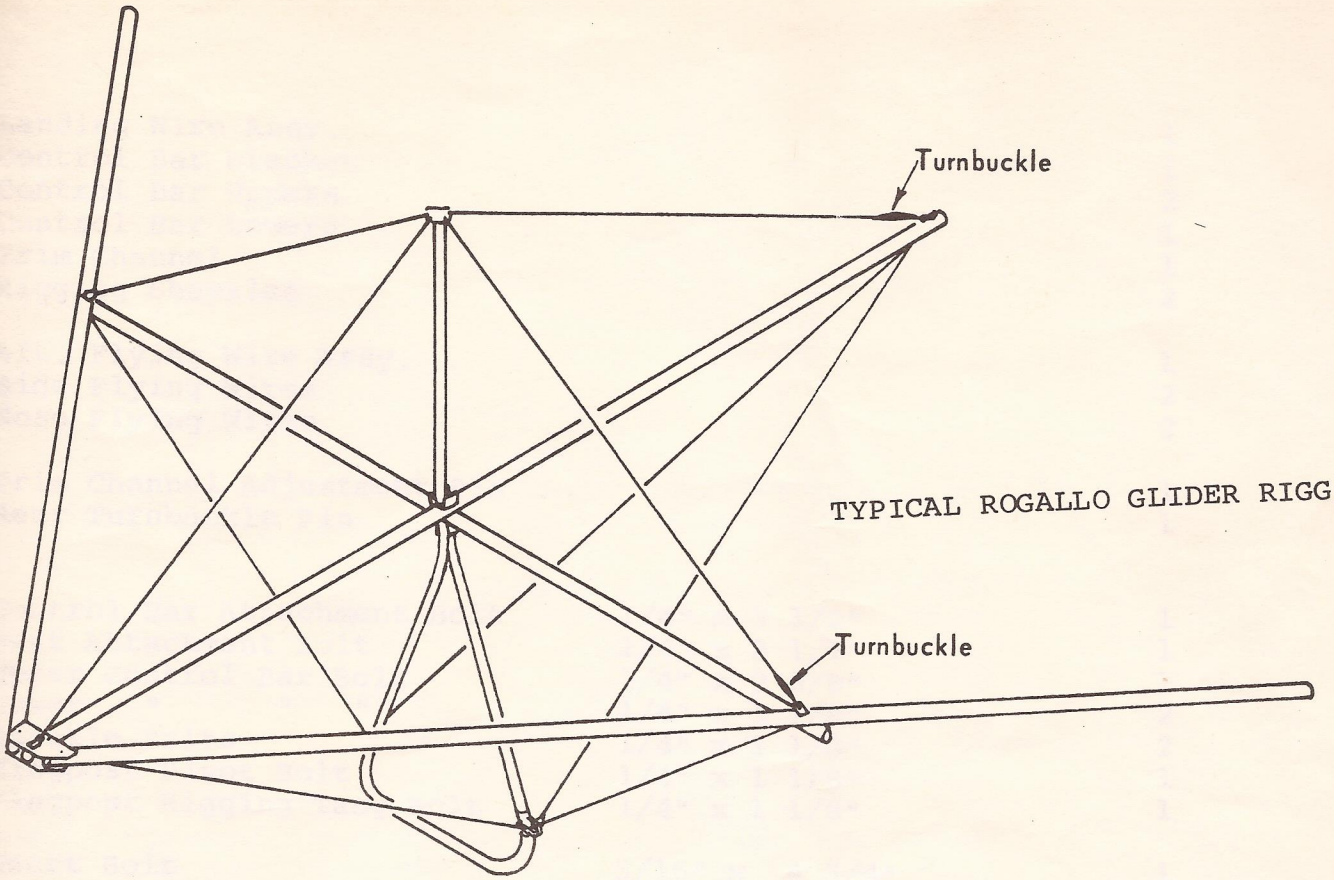
4. Using the drawing on a preceding page as a guide attach the crossbar assembly to the keel. Find the longest bolt in the kit (5/16" x 4 5/8"), add a washer, and put it through the control bar bracket. Next add one of the injection molded tubing saddles, and push the bolt through the cross-bar. Add two more saddles back-to-back and push the bolt into the keel. Add the stainless steel kingpost bracket on the top. The heartbolt is to the rear. Add finally a lock-nut and tighten until a couple threads are visible on the bolt. This is the most important bolt on the glider, so inspect it regularly. No washer is used on top!

5. Turn the glider right side up, support the nose and tail, and open the leading edges a couple of feet. The crossbar should be 90 degrees to the keel.

6. The upper rigging, or landing wires are installed by pressing the upper rigging tang dowel into the top of the king-post. Be sure the bolt that secures the tang to the dowel is tight; it is very difficult to remove once it has been pressed into the kingpost. The mark on the tang indicates the forward wire. The machined aluminum kingpost pivot is inserted into the lower end of the kingpost. and the pivot is bolted to the bracket with a ¼" x 1 1/8" bolt. No washers are used so there are no exposed threads to cut the sail when it is folded.

7. The forward upper rigging tang is installed under the rear nose plate bolt and tightened. Use washers and locknuts. The rear upper rigging tang is fastened under the tail bolt, and the turnbuckle fastened to the tang with the quick release pin.

8. While the glider is supported above the floor the control bar can be bolted to its bracket. Use a ¼" x 3½" bolt, washers, and locknut. It is bolted to the forward hole, and the trim channel is to the rear.

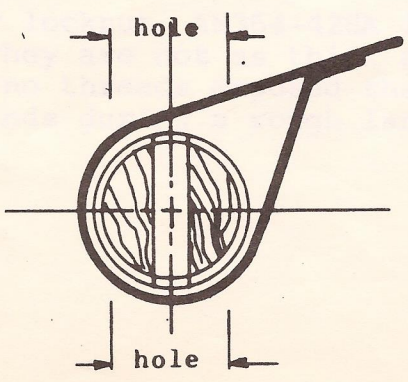


TYPICAL ROGALLO GLIDER RIGGING

9. The lower rigging, or flying wires, all originate from a stainless steel shackle that is bolted to the machined aluminum fitting in the control bar. The rear wires are fastened to a double rigging tang that is fastened to the tail bolt during set up for flight. These wires should be slipped onto the shackles first. The side wires are next. They can be distinguished by their curved rigging tang that nests against the crossbar when assembled for flight. The forward wires are now slipped onto the shackles and the shackles bolted to the control bar.

10. The forward flying wire tangs are fastened one each to the leading edge pivot bolts. They do not cross! Use washers and locknuts and tighten the bolts.

11. Spread open the leading edges so they cross the end of the crossbar. Using the hot knife, the crossbar holes must be cut into the leading edge pockets in the manner similar to those on the keel. Locate the hole in the leading edge, and holding the sail up at a 45 degree angle, cut 2" diameter holes in the top and bottom of the pocket. This is shown in in the diagram below.



1. Remove cover and untie sail.

2. Erect kingpost and attach the rear turnbuckle with the quick-release pin. Uncoil the side flying (lower) wires and lay out the forward.

3. Rotate the cross bar 90 degrees to the keel.

4. Open the leading edges and attach the upper-side wire tang to the bolt insert through the leading edge. Add two spar saddles back-to-back and push the bolt through the crossbar. Slip the lower-wire tang on and attach the nut.

5. Repeat for the other side.

6. With the glider facing the wind, lift the nose so that the wind fills the sail. The glider will start to fly and the control bar will drop down. Set the control bar on the ground and pull the nose of the glider toward you. The lower wires will become taut. Put the nose down on the ground.

7. Pick up the tail-rigging tang and hold the tail of the glider. Attach the tang, the washer and the nut.

8. Check and tighten all the fittings and the nuts.

9. Be sure no wires are twisted or kinked.

10. The glider is assembled in this manner, so that the upper rigging takes the wind load on the crossbar. If it weren't supported, it could bend in a high breeze.

11. To fold the kite just follow the steps in reverse.

SEAGULL III PARTS LIST

PACKAGE #1

DESCRIPTION	SPECIFICATIONS	QUANTITY
Keel		1
Crossbar		1
Right Leading Edge		1
Left Leading Edge		1

PACKAGE #2

Airframe Saddles		7
Upper Nose Plate		1
Lower Nose Plate		1
Kingpost		1
Kingpost Channel		1
Kingpost Pivot		1
Kingpost Plug		1

Landing Wire Assy.		1
Control Bar Bracket		1
Control Bar Uppers		2
Control Bar Lowers		1
Trim Channel		1
Rigging Shackles		2
Aft. Flying Wire Assy.		1
Side Flying Wires		2
Nose Flying Wires		2
Trim Channel Adjustment Pin		1
Rear Turnbuckle Pin		1
Control Bar Attachment Bolt	1/4" x 3 1/2"	1
Seat Attachment Bolt	1/4" x 3 1/2"	1
Upper Control Bar Bolt	1/4" x 2 3/8"	1
Lower " " "	1/4" x 1 1/8"	2
Shackle Bolts	1/4" x 1 1/8"	2
Kingpost Pivot Bolt	1/4" x 1 1/8"	1
Kingpost Rigging Tang Bolt	1/4" x 1 1/8"	1
Heart Bolt	5/16" x 4 3/4"	1
Leading Edge Bolts	5/16" x 4 1/2"	2
Nose & Tail Bolts	5/16" x 2 1/2"	5
Rigging Shackle Locknuts	AN 363-428	2
Lower Control Bar Nuts	AN 364-428A	2
Kingpost Pivot Nut	AN 363-428	1
Seat Attachment Bolt Nut	AN 363-428	1
Control Bar Attachment Nut	AN 363-428	1
Upper Control Bar Nut	AN 363-428	1
Kingpost Tang Locknut	AN 363-428	1
Nose Locknuts	AN 363-524	4
Heart Bolt Locknut	AN 363-524	1
Leading Edge/Tail Wingnuts	AN 350-1	3
Leading Edge/Tail Safety Pins	AN416-1	3
5/16 Washers		20
1/4 Washers		17
Trim Channel Screws	3/4" x 10	4
Sail Screws	3/4" x 10	8
Sail		1

The lower control bar locknut, AN364-428A is different from the other ¼" nuts. They are not as thick as the others; this is so that there are no threads exposed that could possibly cut or scrape your hands during a rough landing.