

## INSTALLING MYLAR HINGES IN ARF TRAINERS

Eric Henderson.

### ***Introduction***

The success of flying a plane hinges upon correctly installing the control surfaces. Most ARF's now come with the popular Mylar flexible hinges. These hinges are very good for their intended task. They are strong and light. The hinge points do not get gummed-up with the installation glue. They do, however, require some care in their installation.

If you are assembling a Trainer-type ARF the chances are that you are new to the hobby. The instructions usually simply state, "Glue hinges in place". Almost all directions assume that you know how to handle super-glue. What follows are a few tips that will help ensure that you do not experience loose hinges or control failure during flight that could lead to less than desirable results.

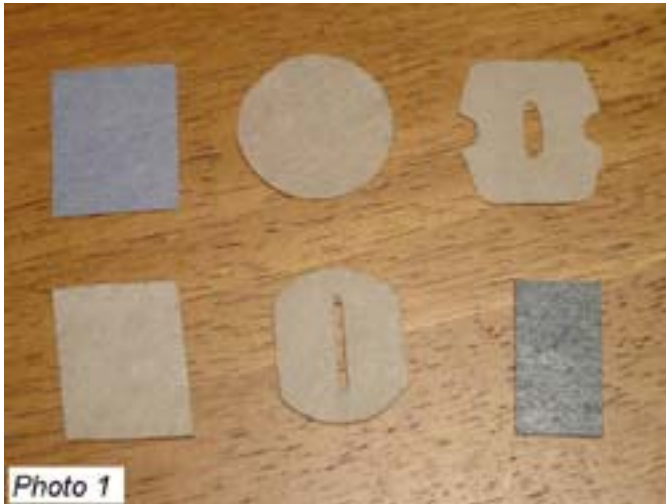
The working concept of a Mylar hinge is that a coating of absorbent fiber is adhered to both surfaces of flexible Mylar. The hinge is inserted in both parts and then glued while still in that position. The coating is designed to readily accept *thin* CA adhesive. It will "wick" the glue over its entire surface and into all of the adjacent material, such as balsa wood. The advantage of the Mylar hinge is that all of the hinges can be put in place and then the glue applied. Mylar hinges are also extremely durable.

The Mylar hinges are intended to be used only with a specific type of glue. This glue is known as *thin* CA, sometimes called **Cyanoacrylate** and often called "Super-Glue". If there is no glue supplied with the model, you need to select the right type. The thing to look for is the word "thin". The glue comes in thick, medium and thin designations. It may also say slow, medium or fast on the bottle, with some indication of how many seconds it will take to bond. "Thin" usually cures in 5-10 seconds and is the glue that you want. There is also a new flex-thin CA that is specifically designed for the Mylar hinging process, from Bob Smith Industries. <http://www.bsiadhesives.com/>

This type of glue sets very quickly. It is often referred to as instant glue. It definitely sticks your fingers to things, or your fingers to your fingers, instantly! It is a very good idea to keep a brand name CA solvent handy at all times. Acetone also works very well with freshly-used CA. It comes in quart or gallon cans and can be purchased at your local hardware store. Try not to wipe with paper towels because the glue will come right through the towel and glue your finger as if it were applied directly.

### ***Types of Hinges***

Mylar hinges come in many shapes and sizes. Some are round and some are oblong. Many have a slot cut in the middle because it allows them to be a little bit more flexible (Photo 1). The success of a Mylar hinge really depends upon the accuracy of the slots that have been cut in the control surfaces.



**PHOTO 1 - Different types of hinges**

There are several things to do before you actually glue the hinges. The first thing to check is that the hinges fit. Look for a firm fit with no gap. Thin CA does not bridge gaps. If there is a loose fit you can use half of another hinge to get a good snug fit. You also should check to see if the hinge slots have been cut correctly. Sometime the hinge slots are not cut in the center of the hinge line. The hinge slots can be adjusted by taking a sharp modeling knife and cutting a new slot that is exactly centered. A completely new slot can often be easily cut adjacent to an old or badly positioned hinge slot. Extra hinges can also be added if you don't think there are enough to do the job.

***Your primary goal when hinging is to get the two surfaces to be as close together as possible without inhibiting or restricting the movement of the control surface.*** The gap between control surfaces influences how effectively the control surface operates the plane. If the gap is too big then air passes through the gap and can disrupt the pressure between the top and the bottom of, for example, a wing aileron. With two ailerons these disturbances could be unequal and lead to twisting in loops and sluggish roll responses, particularly at slow airspeeds. Mylar hinging material does not bridge large spaces very well and can allow the control to move up and down at the hinge line if the gap is too great. During flight this will allow the control surfaces to go into a condition called **flutter**. A violent oscillation that is very destructive to the control surface. If the gap is too tight it will restrict the movement of the control surface. (See **Actual gluing**, below, on how to obtain a correct gap.)

The hinge itself has to be positioned so that approximately half of the hinge is in each opposing slot. The hinge slots may be too shallow. If this is the case you should make them deeper with a sharp modeling knife. Centering the hinge can be hard to do when you do four or five hinges at the same time. They will move if the slot is deeper than half the size of the hinge. (This is usually the case.) It helps if you mark a centerline on each hinge so that you can visually check to see if they are lined up correctly.

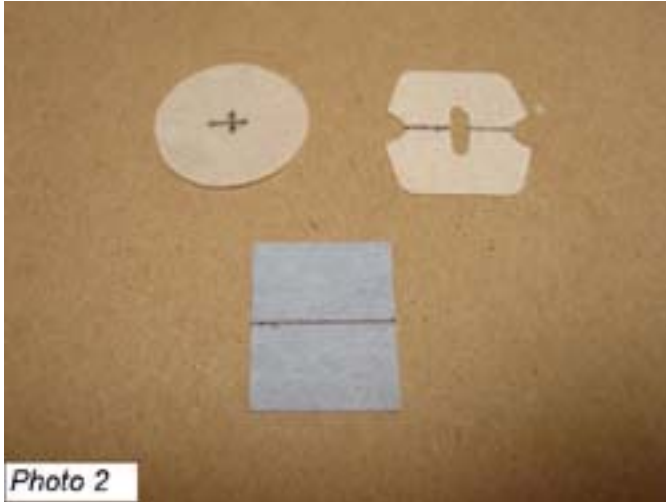


Photo 2

### PHOTO 2 - Marking centering lines

The lines themselves do not help you much when it comes to positioning a hinge during installation. A neat trick is to push a modeling pin through the center of the hinge before bringing the surfaces together. The pins keep the hinges centered but **are removed** when you are ready to apply the glue.

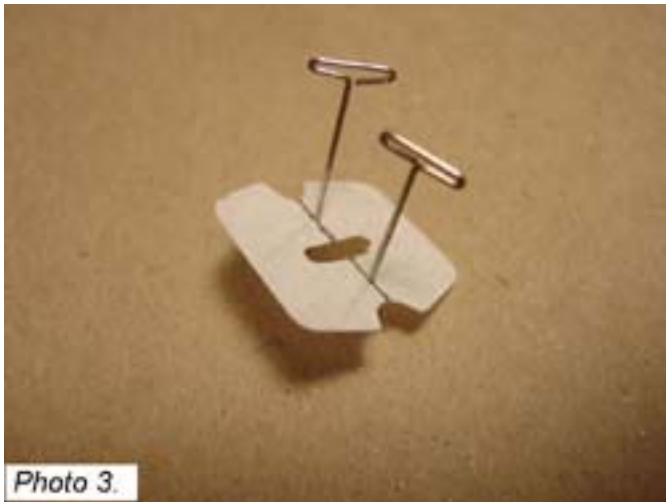


Photo 3.

### PHOTO 3 - Marking centering with pins



Photo 4

**PHOTO 4 - Pins being used to center hinge**

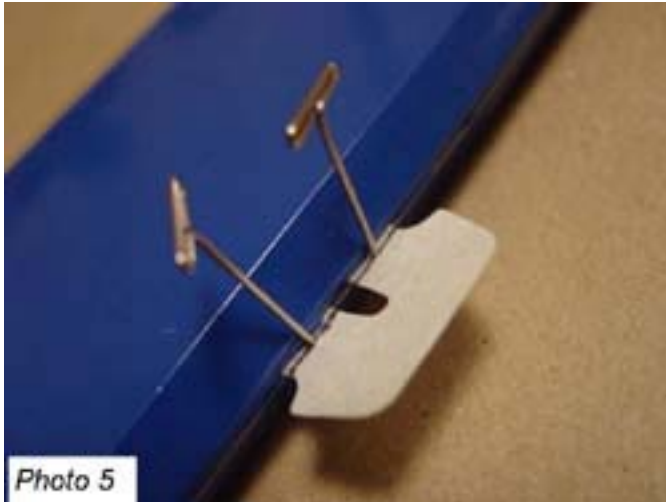


Photo 5

**PHOTO 5 - One surface removed for clarity**

***One thing NOT to do is glue the hinges into one component and then glue the other side in a separate action. This is because the super-glue really only wicks along the surface of the hinge once! Dry glue will block the flow of the glue and inhibit the gluing process.***

### ***Applying the Glue***

Dispensing the glue is probably the hardest part of this process but you can do several things to make it much easier. A bottle of super-glue tends to let too much glue out of the nozzle. When you tip up the bottle, gravity helps the glue leave as does the heat of your fingers because it expands the air in the bottle. A couple of options are to either use a capillary applicator or a completely separate dispenser such as a plastic Pipette. Hobby stores sell these parts and usually carry one or the other. Micro tubing is inserted in the nozzle of the glue bottle and allows you to control the glue application a drop at a time. You do not have to tip the bottle upside down and you can actually see the glue arriving down the micro-bore tube.



**PHOTO 6 - Glue Application aid - Capillary tip on regular glue bottle**

**Actual gluing.** The two parts are brought together with all of the hinges in place. Check for free movement of the surface. Ensure that the position of all of the hinges is correct BEFORE applying glue. Look above and below to see if a hinge is not half in one and half out of the other slot--You do not get a second chance.



**PHOTO 7 - Positioning all hinges prior to gluing**

Bend the control surface to its maximum deflection while holding it tightly against the main surface. Drip two or three drops of super-glue onto the hinge line of each hinge. Return the control to its neutral position for about 20 seconds and then fully deflect it in the opposite direction. Then repeat the process again on this side.



**PHOTO 8 - Dripping in CA - approx three drops**

Beware of using too much glue. It will run though onto the other surface and also along the hinge line. Keep cleaning materials handy. Also watch out for the glue getting onto your fingers because it will mark everything that you touch. After another 20 seconds, flex the control surface in both directions. Then repeat the process again after about five minutes. Do not worry if you hear a cracking sound. This is normal and is just excess glue freeing up.



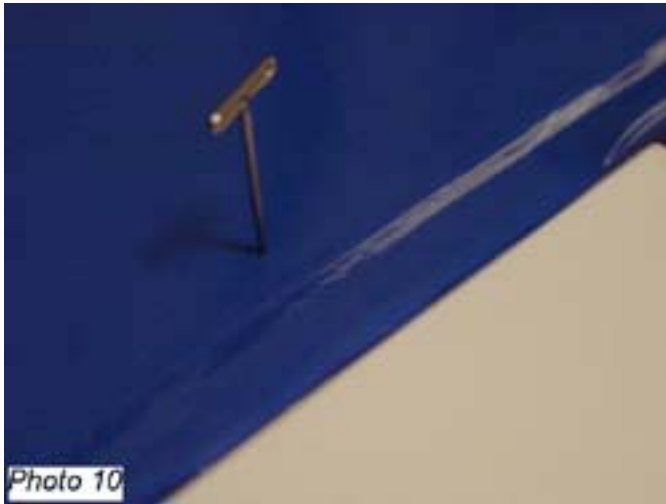
**PHOTO 9 - Flexing the surfaces to maximum throws**

***Operating tip: Use a small 3-5 inch fan to blow the CA fumes away from your face and eyes. The vapor has a stinging effect that could have longer lasting detrimental effects. Make sure there is proper ventilation during the entire hinging process, especially when gluing.***

### ***After Gluing***

#### **Things to do after gluing**

Even though the Mylar hinges are very strong, it is worth taking some extra precautions to deal with unexpected flight conditions. It is a good practice to put a pin through the hinge in both the control surface and the main component, such as the wing. To hide the pin, you can insert it from underneath and cut it short so that it does not come through the top surface. A tiny drop of CA will ensure that it does not fall out.



**PHOTO 10 - Pinning hinge to lock in place after gluing**

**What if it all goes wrong?**

You may not have pushed the control surfaces close enough together or they moved before the CA had grabbed! Sometimes field damage can cause several hinges to get broken for instance, after a very bad “landing!” To repair any of these situations, cut off ALL the control surface’s hinges and trim them flush on both sides. You can either cut new slots or use the same slot. You don’t have to remove the old hinges.

The piece of Mylar that is still in the wood serves as a good guide for a modeling knife. Just create a new slot by cutting back and forth along the old hinge. The new hinge will readily glue to the old one. Be sure to cut all of the new slots on the top of both the control surface and the flying surface, so that the control surfaces line up perfectly again. The repair will be invisible and the new hinge line will have no effect on the flight characteristics of your plane.

**Another thing that you can do with Mylar-hinges:**

The area where a horn bolts through a control surface tends to be a weak point. Bracing these areas with another/extra Mylar hinges is very effective. Just make a couple of new hinge-slots and insert the Mylar hinges. You can also simply strengthen the horn area with a Mylar hinge and not use it as a hinge. Wick in some CA and let it dry. Then just cut off any excess hinge material. Now you can drill and fit the horns in a much stronger area than the original balsa wood.



**PHOTO 11 - Bracing a control horn position**

## **Summary**

### **Extra optional materials to buy:**

- Acetone
- Q-tips - to wipe off excess glue
- More hinges

### **Tools:**

- Glue application micro tubing or pipette tool
- Modeling pins
- Thin tip "Sharpie" pen



Photo 12

**PHOTO 12 - Typical tools used**

### **Check list before you hinge:**

1. Hinges fit.
2. Position is equal in both parts.
3. Control surfaces line up.
4. Correct applicator.
5. All pre-work is completed on control surface.
6. Solvent and wipe-cloth handy.

### **Hinge Installation plan:**

1. All hinges in place.
2. All hinges centered.
3. Bend control surface to max position.
4. Apply few drops of CA to top of each hinge.
5. Hold in place for 20 seconds.
6. Turn over and repeat process on other side.
7. Flex the control surfaces until CA has cured.
8. Watch for, and wipe off, any excess glue with Acetone/CA-solvent.

### **Products mentioned:**

Bob Smith Industries - Flex-thin Zap.

Thin CA

Mylar hinges

Pipettes

CA Capillary tubing