Tornado 2026
Division B/C Helicopter
Build Manual V1.0

By *J&H Aerospace*

www.jhaerospace.com

A high performance helicopter legal Science Olympiad Helicopter 2026 competition

Includes materials for two complete helicopters

Tools/materials required: rubber lubricant (son of a gun works great), winder, needle nose pliers/wire cutters, CA glue (or Duco/Ambroid/Sigment), razor blades, sandpaper, ruler, scissors. Optional: Torque meter, turns counter (volareproducts.com).

Tornado Helicopter

J&H Aerospace

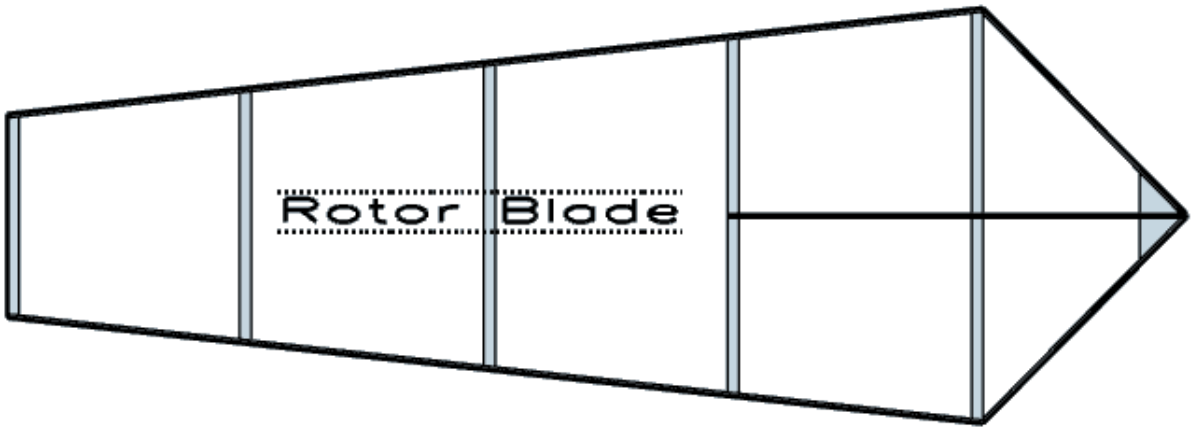
Building Instructions

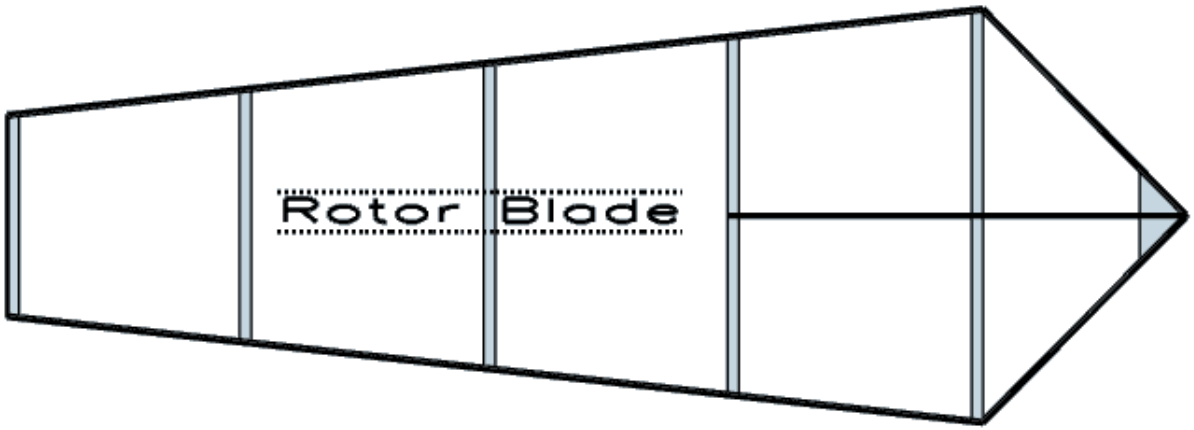
Congratulations on your purchase of the Tornado helicopter! You are about to build a reliable rubber powered helicopter capable of over 1 minute flights in small rooms.

1. Parts list

Before beginning construction, please verify that your kit contains all of the necessary parts listed below. Please be aware that some of the laser cut parts may have separated from their carrier sheet, so you should ensure that all of those parts are present and undamaged.

1. 0.020”x13” carbon rods (9x)
2. Parts Sheet #1: Motorsticks, 1/8” balsa
3. Parts Sheet #2: Ribs and caps, 1/16” balsa
4. Parts Sheet #3: Rotor hubs, 1/16” plywood
5. Parts Sheet #4: Blade tips, 1/32” balsa
6. ¼” sq x 5” sticks (2x)
7. ¼” sq x 10” sticks (2x)
8. Veggie bag
9. 1/8”x16’ rubber
10. O-rings (8x)
11. Thread binding
12. Ballast (modeling clay)
13. Rotor bearing assemblies (2x)
14. Nose rings (2x)


Rotor Blade


Rotor Blade

Flight Data Log

Entry Number	Date	CG Location	Incidence Settings	Airframe Weight	Initial Rubber Length	Turns	Torque	Backoff Turns	Climb Height	Flight Time	Turns Remaining	Comments/Adjustments
1												
2												
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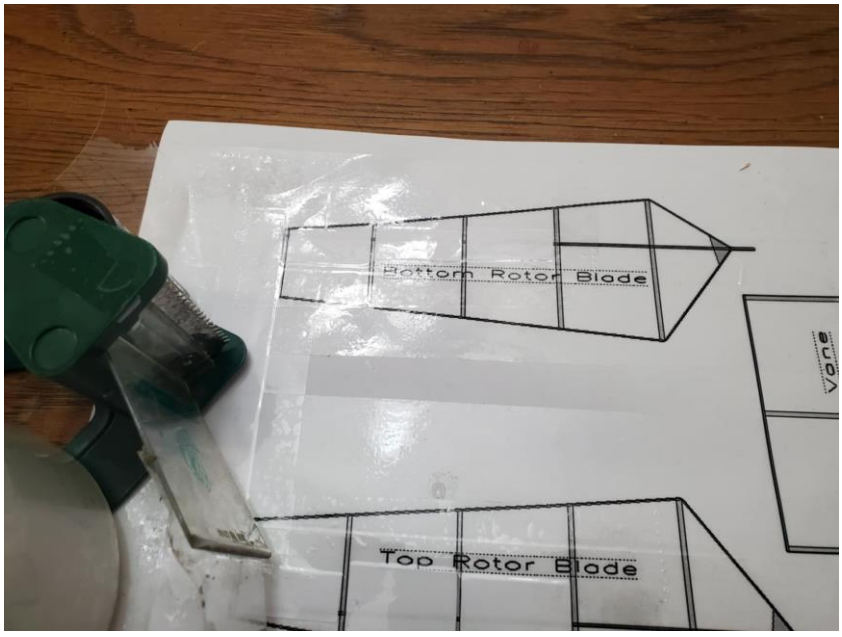
Tornado 2026 does not use a moving vane for stability because the winglets on the rotors to improve stability in contact with the ceiling.

Before beginning construction, be sure to verify that you have all of the recommended tools for building your Tornado. Also be sure to verify that all parts are present in the kit. If anything has been damaged in shipping, please contact us IMMEDIATELY to get those issues resolved. Occasionally a component will be missing or different from what's shown in the instructions. Please contact us for that as well. Sometimes minor changes are made during the production life of a model, so most confusion is simply related to these changes.

DO NOT separate all the parts out of your parts sheets. Only separate parts out as you actually need them so that they don't get damaged or lost.

The kit documentation sheets include patterns for the rotor blades. These are used to correctly align and assemble the helicopter components

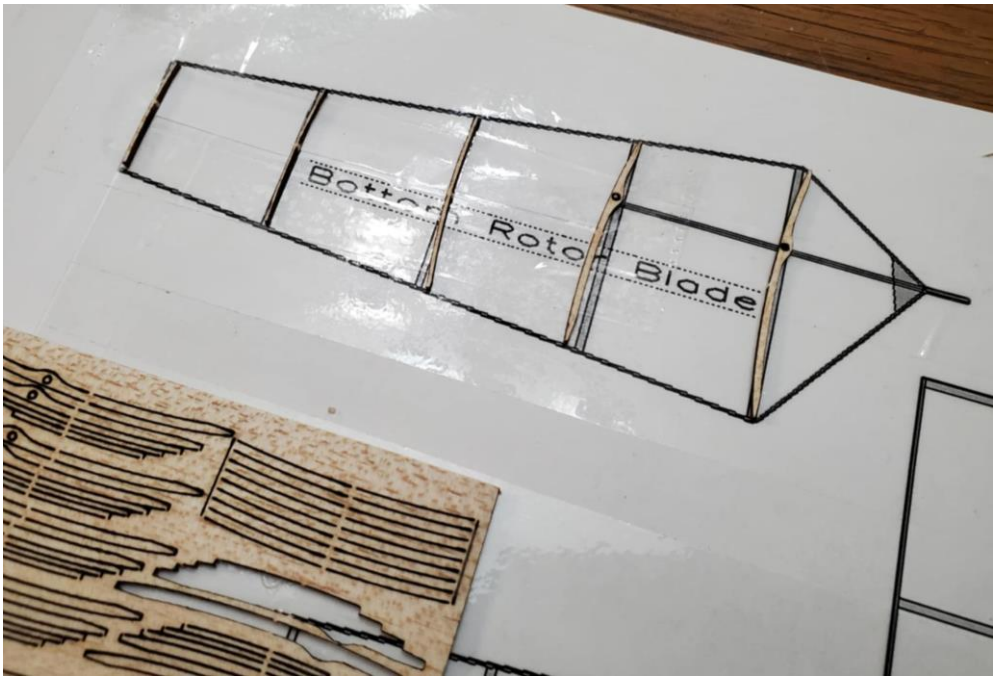
Lay down packing tape over the leading and trailing edges on the plans to make a non-stick surface. If you are working on a table, you can actually overlap the tape over the edges of the plan to secure it to the table, which will make construction much easier.



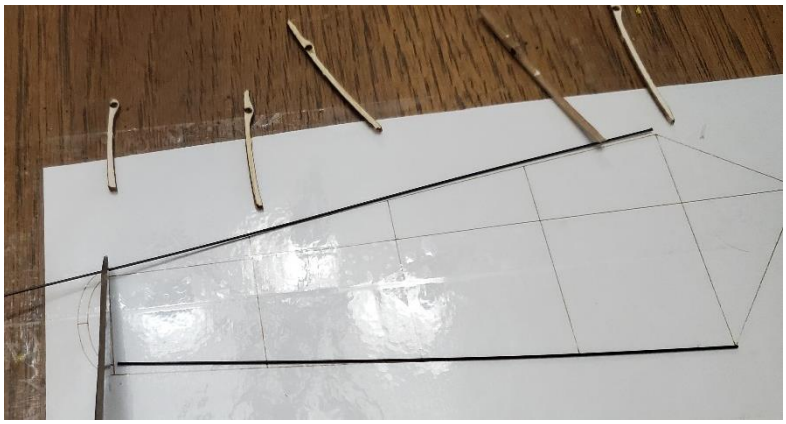
All blades on the Tornado 2026 are identical. Enough patterns are supplied to build the entire rotor set at once, should you prefer, or you can build them on at a time off the same pattern.

Use a razor blade to carefully separate a set of rotor ribs from the 1/16" parts sheet. Be careful because the ribs are quite fragile.

Lay out the ribs, in order, for the rotor blade.

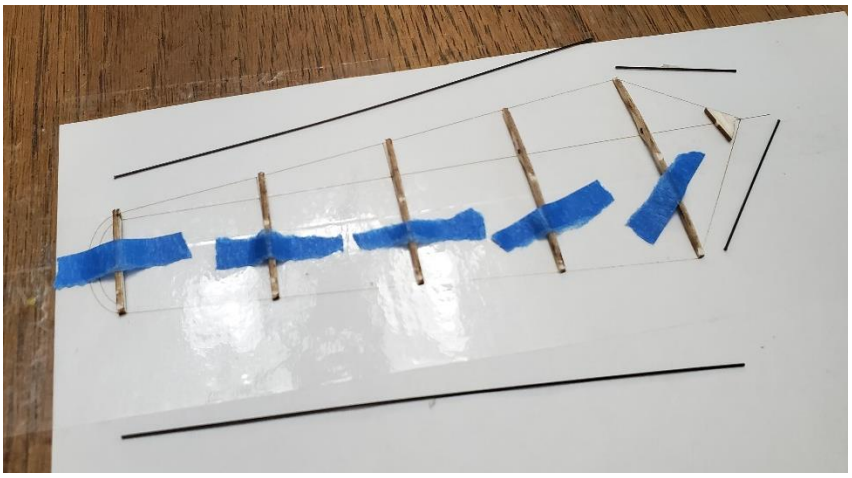


Lay in place one of the 0.020” carbon rods (these are the thin rods). Use scissors or wire cutters to trim the other end of the carbon rod. DO NOT throw away the excess carbon—you will need it later!

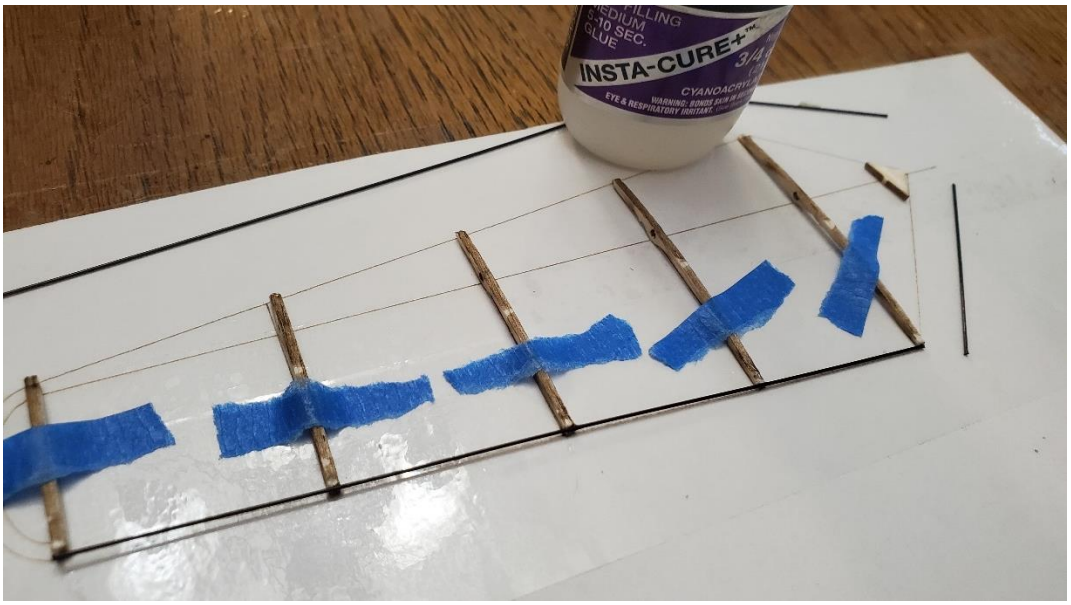


Continue cutting carbon rods to size until you have all four (4) of the outline parts as shown.

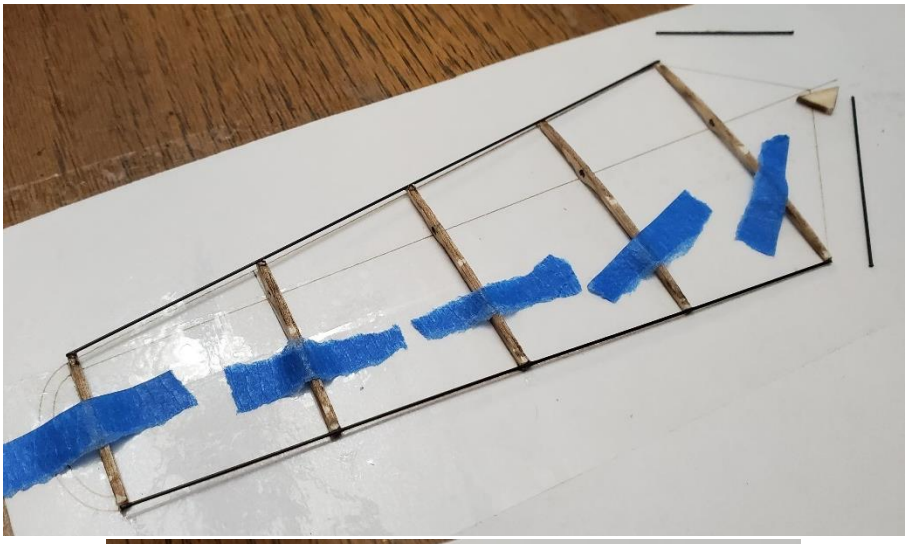
Gently tape the ribs in place over the template using masking tape or scotch tape, being careful not to crush or break the ribs (the tip ribs are particularly fragile!).

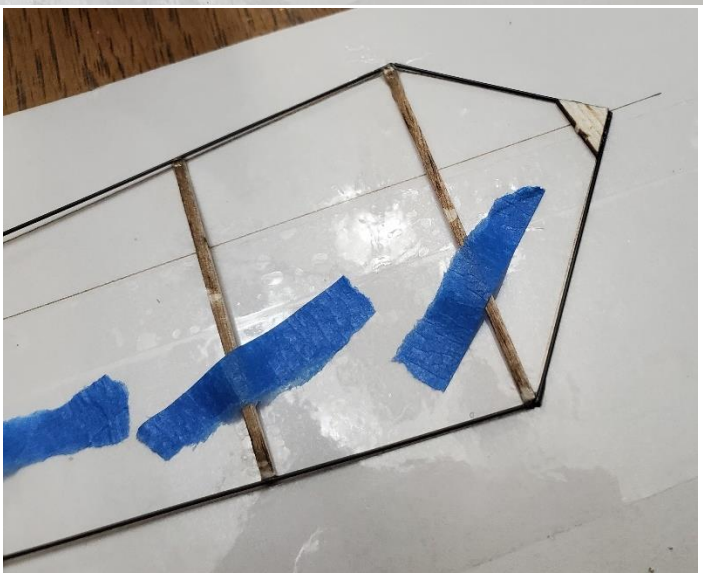


Glue the ribs to the carbon outline. Take your time to try to get them aligned as closely as possible over the rib marks on the template.



Continue attaching the carbon outlines as shown. Note that the triangular gusset at the root end of the blade is used to reinforce that joint.





You can now remove the tape strips and carefully remove the blade from the plans.

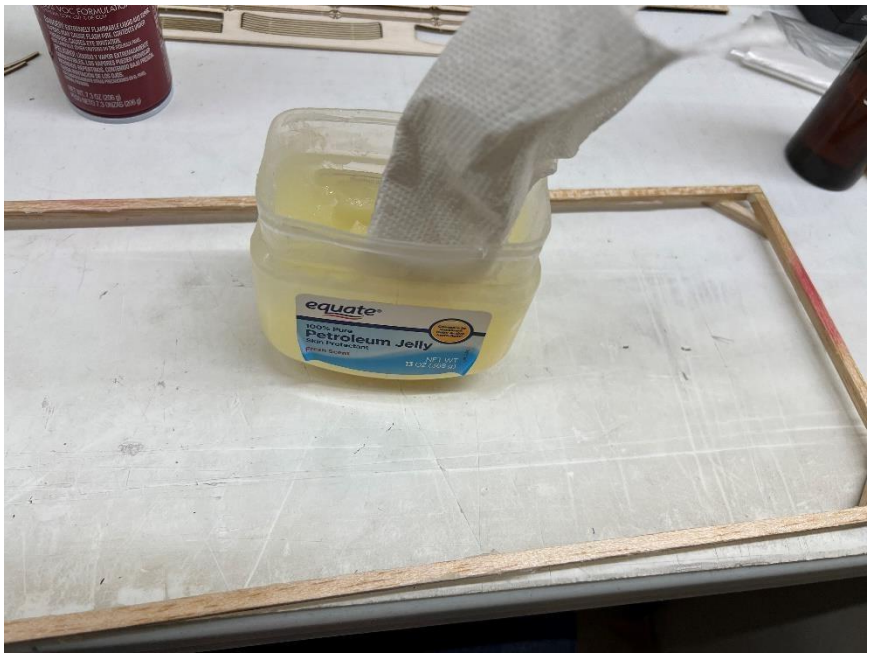
Repeat the above steps to finish **three (3) more** blades.

The large ¼” square sticks are used to make your covering frame. Glue them firmly together to form a rectangular frame as shown.

You will need 3M-77 spray adhesive to cover your rotors. Get it out and have it handy. Plan ahead—you do not want to use this product indoors because it will make everything around you extremely sticky!

You need petroleum jelly/vaseline to make the covering frame stick to the veggie bag plastic. This method allows you to reposition the covering so that it can be applied neatly to the flying surfaces.

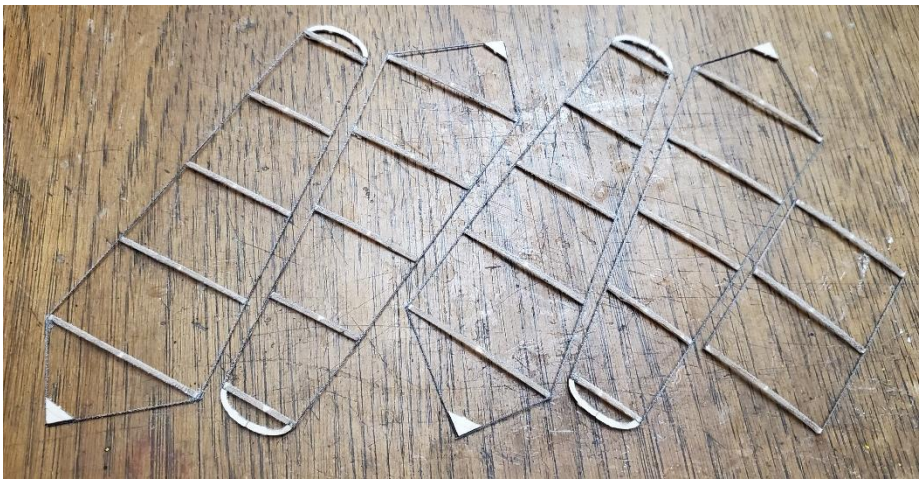
We recommend using a paper towel to smear the Vaseline onto the frame so you can limit the travel of this material. DO NOT get Vaseline/petroleum jelly near any of the rubber bands or strip in your airplane because it will destroy those materials. Also it is best to do this over an alternate workspace that you won't be using for the rest of the build.



Cut out a piece of veggie bag a bit larger than your covering frame. Make sure it is going to be large enough to have about 2 inches of excess on all sides before cutting it out and wasting covering material. You have plenty of extra covering material, so if you don't get it right the first time, try again. Take the piece of covering and wad it up tightly into a ball. Flatten the covering out BY HAND on a clean, flat surface. Now wad it up again. This time, flatten it out fully and completely, again by hand only, and get it as smooth as your hands can get it. Do not try attempt to iron it flat or use any other method than simply smoothing it out with your hands. Take your time to get it right. Once the film is smoothed out (it will now have a crinkled appearance and texture), lower your covering frame, Vaseline side down, onto the covering, and press it down all around to get it to attach to the covering. Now lift the frame-covering assembly off, flip it over, and tension out any wrinkles or excess slack to get the covering as smooth as possible (again, the crinkled texture is good, don't try to get rid of it, and never attempt to heat shrink the film).

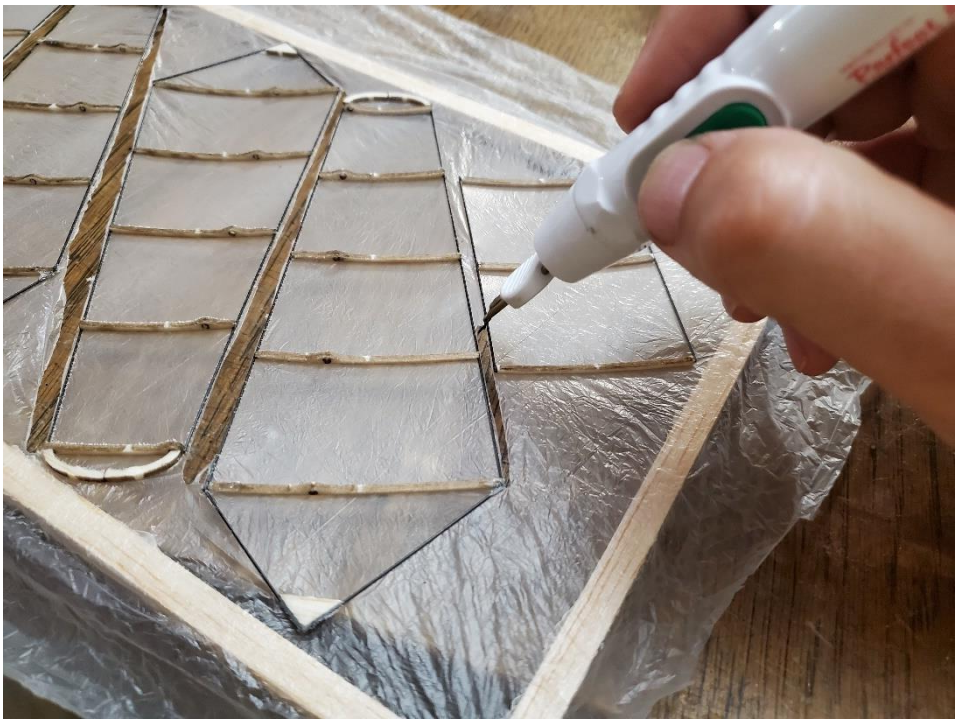
Take your rotor blades outside, or into a spray booth, and spray the convex curved rib side of each with 3M Super 77. This will make them extremely sticky—be careful! It is very easy to damage the parts once they have been sprayed because they will stick to your hands and get damaged if you don't carefully disengage your hands from them. Arrange the parts so they will fit within the bounds of the covering frame.

The rounded blade tips and vane shown below are no longer used.



Lay the parts, adhesive side up, onto a smooth, flat surface. Carefully lower the covering frame, covering side down, onto the flying surfaces. Then gently run your finger around the outlines of the wing and tail to press the film into contact with the parts. Be careful to press very, very gently so that you do not damage the fragile ribs!

Use an electric cautery (available from indoorffsupply.com) or brand new razor blade to cut the film around the outside of the flying surfaces. Do not leave any excess. Try to get as smooth of a trimming job as possible. Excess film waving in the air will make your model fly poorly.

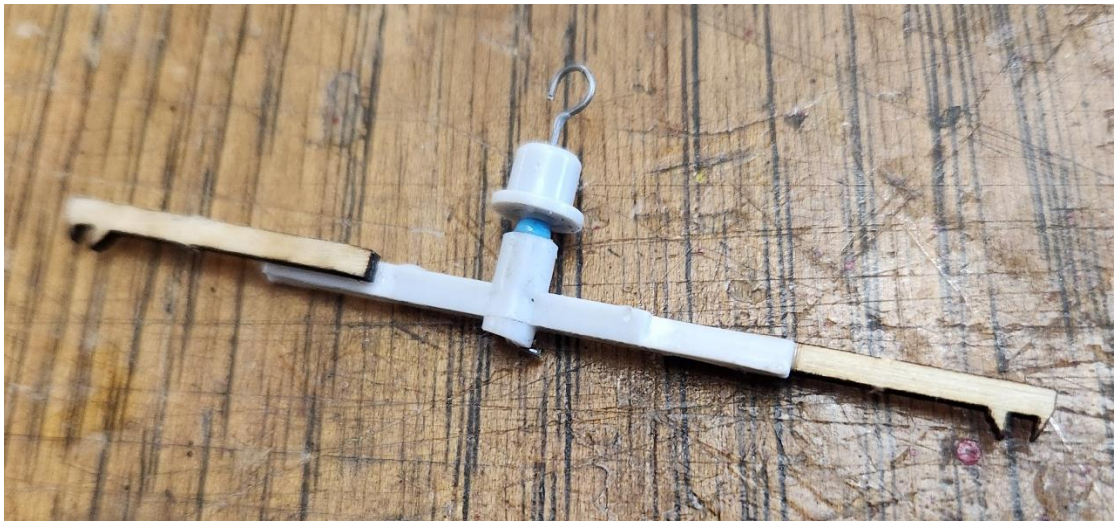


It is time to assemble your rotor hubs. The orientation of these components is absolutely critical. **Failure to EXACTLY follow the orientations shown below will render your helicopter unflyable and will require purchase of a new kit!!!** Please follow the instructions so that you are not delayed by needing to get a new kit and spend unnecessary money on your flying program!

Locate a rotor bearing assembly. Don't get out the mounting ring at this time. Remove the bottom rotor spar stubs from the plywood sheet and attach them to the flat front faces of the plastic rotor hub, lining

up the ends with the engrave marks. Be sure to have the slotted end facing down as shown. This alignment is critical: analyze the photos closely.

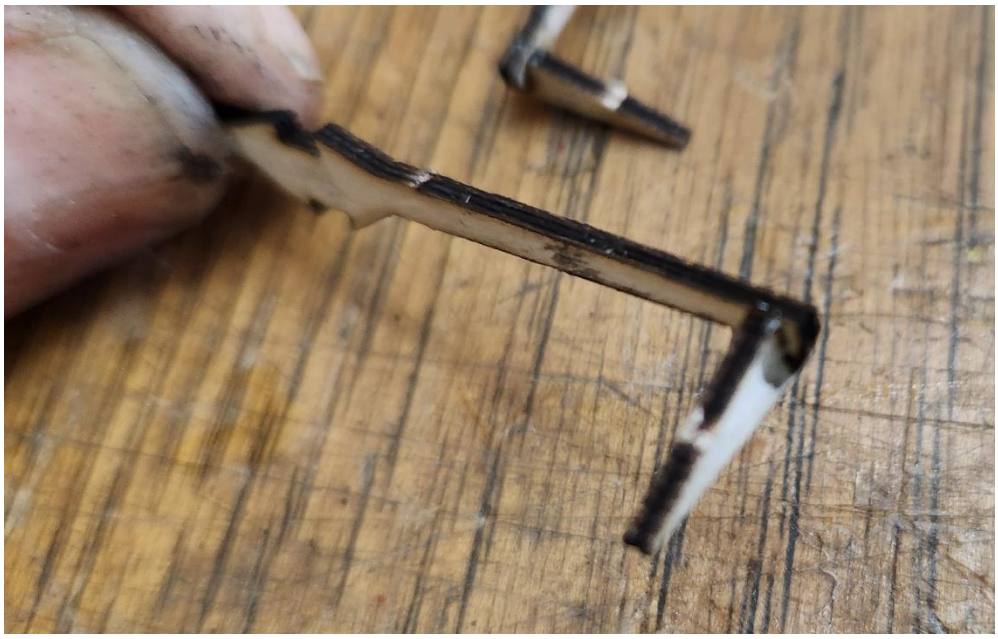
Attach the second bottom spar stub.



Insert and glue the pitch plates in the ends of the spar stubs facing forward from the hub as shown. This alignment is critical to achieve proper rotation of the rotor so do not get it backwards!

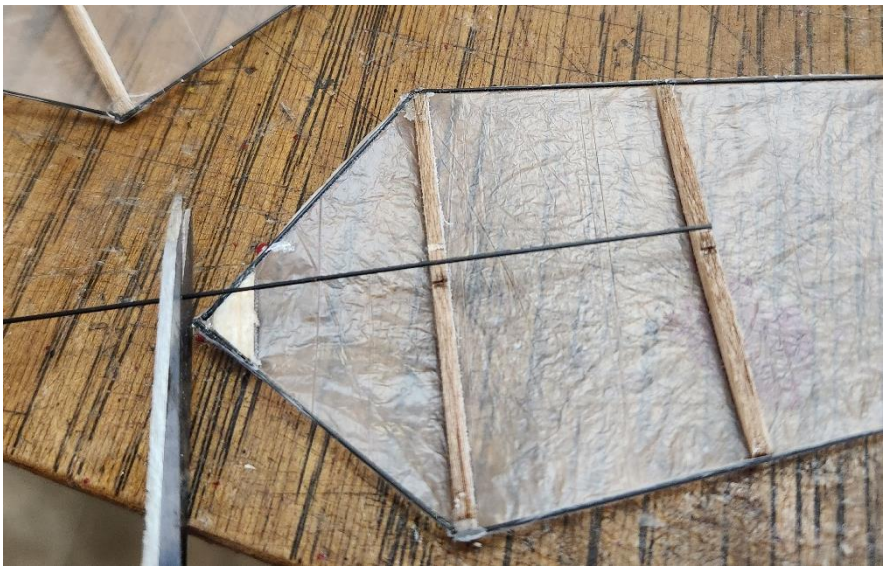
Attach the second pitch plate. Look closely at the photo: don’t get the orientation wrong or your helicopter will not fly, and this step is NOT reversible!

Find the top rotor hub/stub and the corresponding pitch plates. Install the pitch plates in the orientation show.

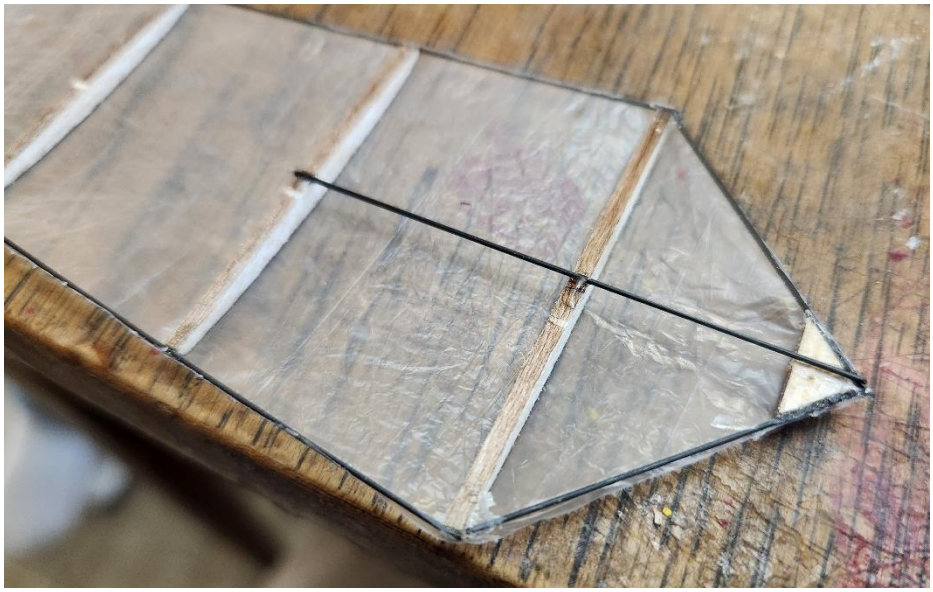


Check the photo below to verify for yourself the correct orientation of the pitch plates. These are necessary to achieve the contra rotating configuration of the rotors.

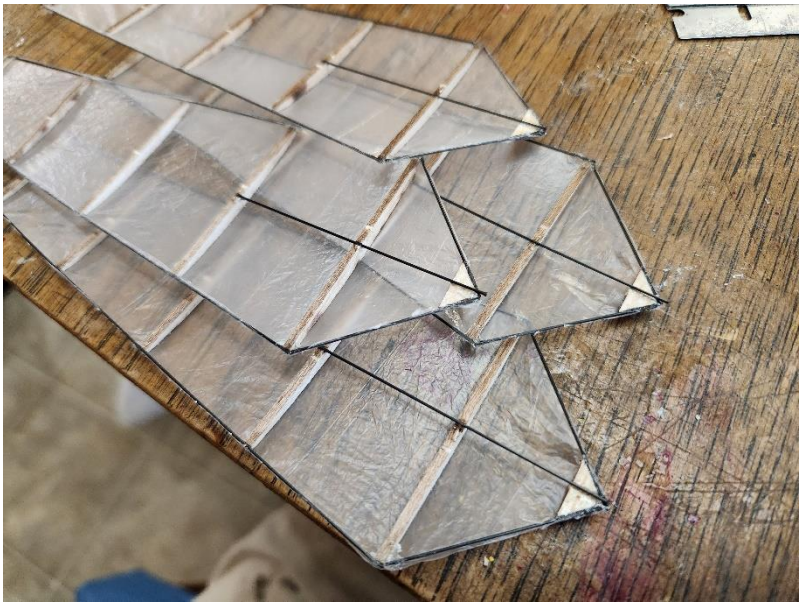
Cut a piece of .020” carbon rod to match the distance between the blade root and the second rib. You will need 4 such segments of carbon rod.



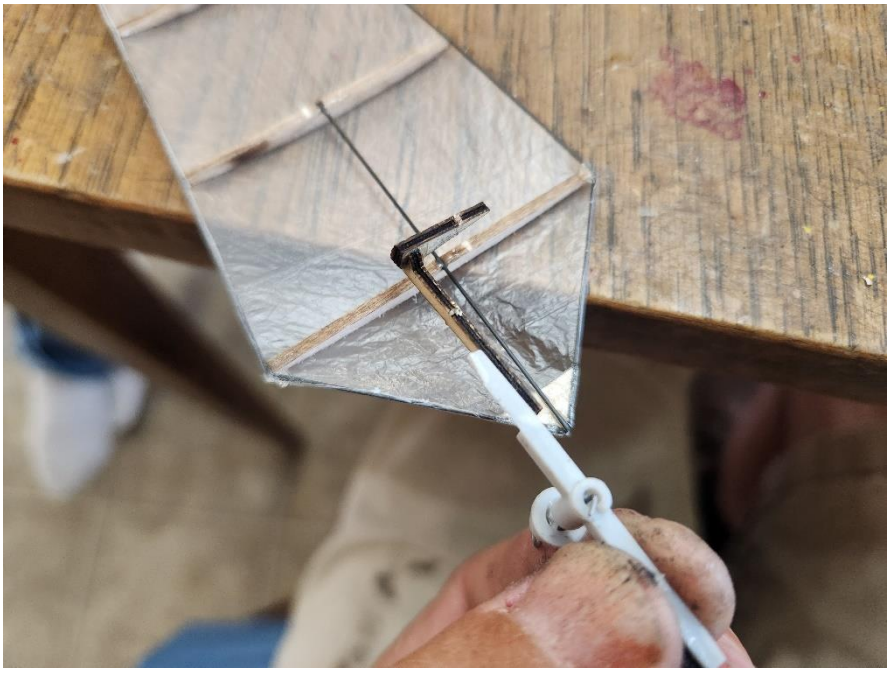
Attach a piece of .020” carbon rod to the bottom of a rotor blade as shown. There are alignment slots in the ribs to show the correct alignment and allow the rod to recess into the rib.

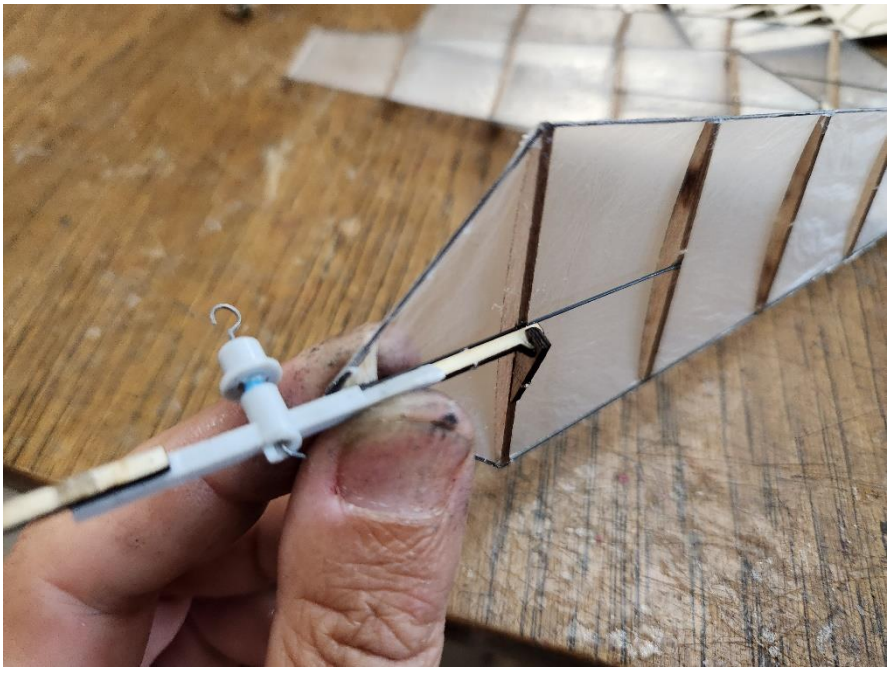


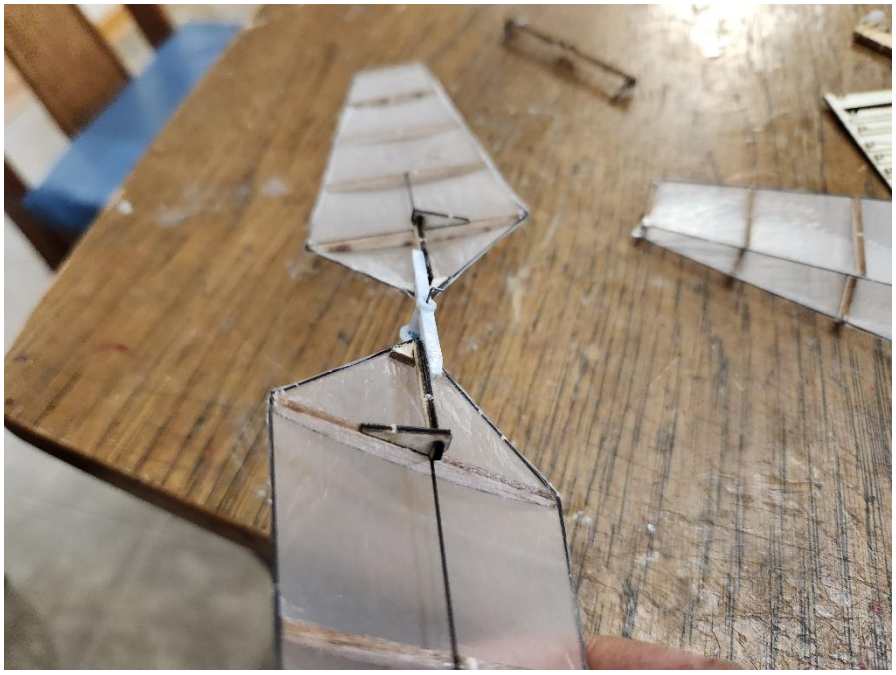
Repeat these steps for the remaining rotor blades.

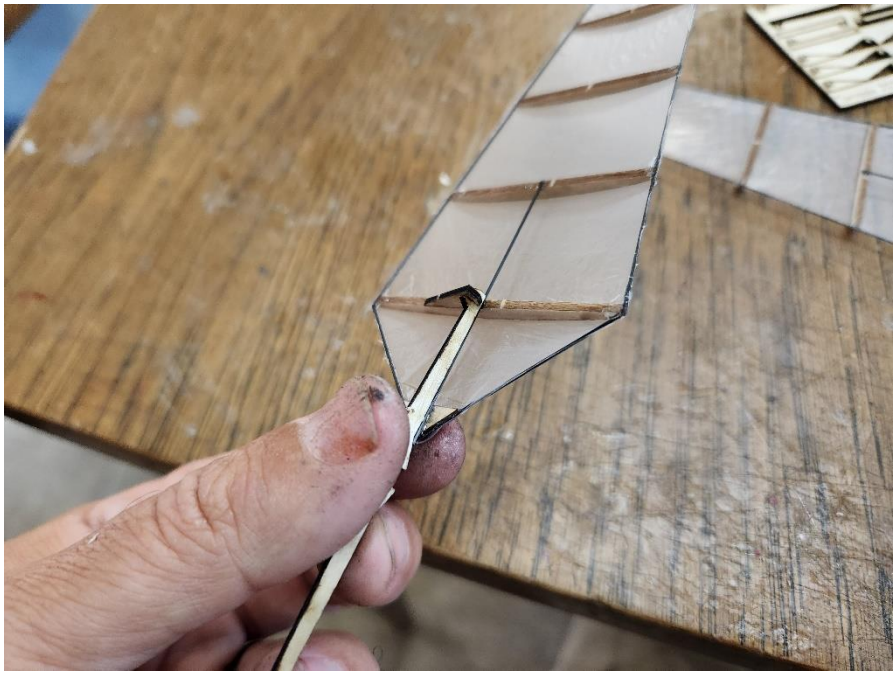


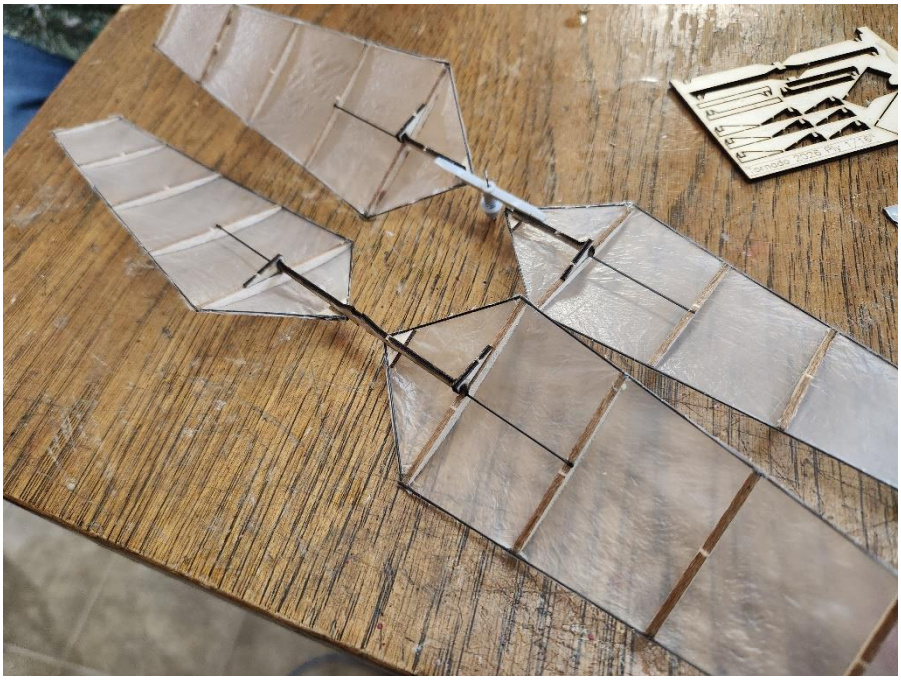
The rotor blades attach to the angled face of the pitch plate and along the wooden spar stub. Make sure they are both firmly attached and exactly aligned with the pitch plate. If your pitch plates are attached in the correct orientation, the order of assembly on blade attachment shown below is noncritical.



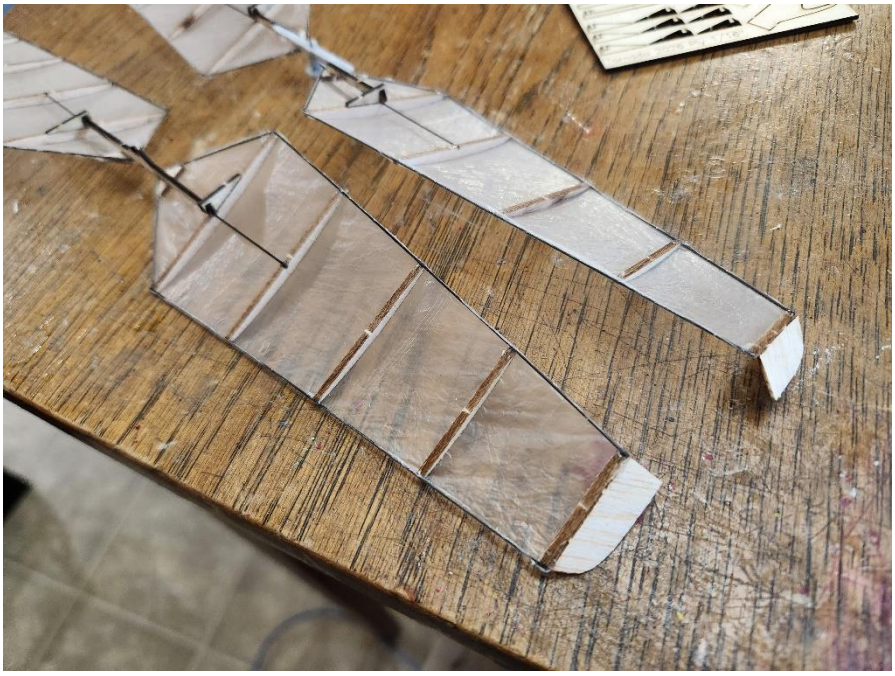








Attach the rotor tiplets as shown. Their angle should be somewhere between 30 and 45 degrees up toward the covered side. If you angle them downward, your helicopter will be unstable. Make sure they're set up right. The tiplets are designed to be angled back so that they do not get damaged by hitting obstacles or in landing. Look at the photo below to verify this orientation.



Remove a motorstick from its carrier sheet. Attach the plywood rubber hook as shown. The hook points toward the narrow end of the motorstick.

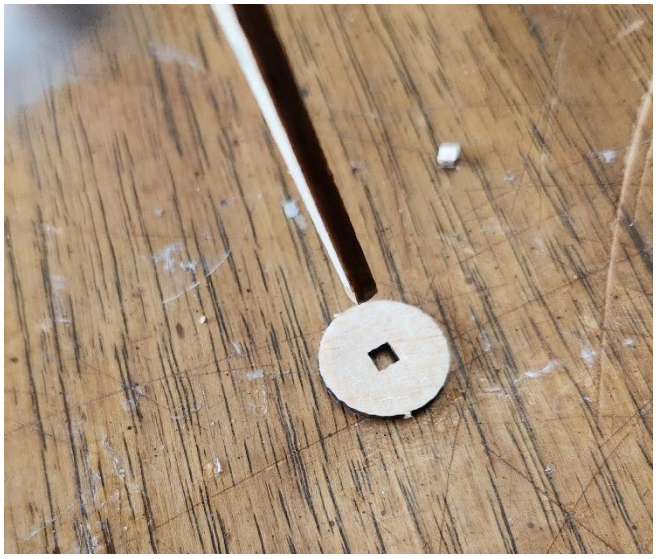
Find the small cutout spacer pieces shown below, and a nose bearing mount.

Insert, one atop the other, the spacers into the nose ring, and glue them in place.

Glue the nose ring assembly in place on the motorstick as shown.

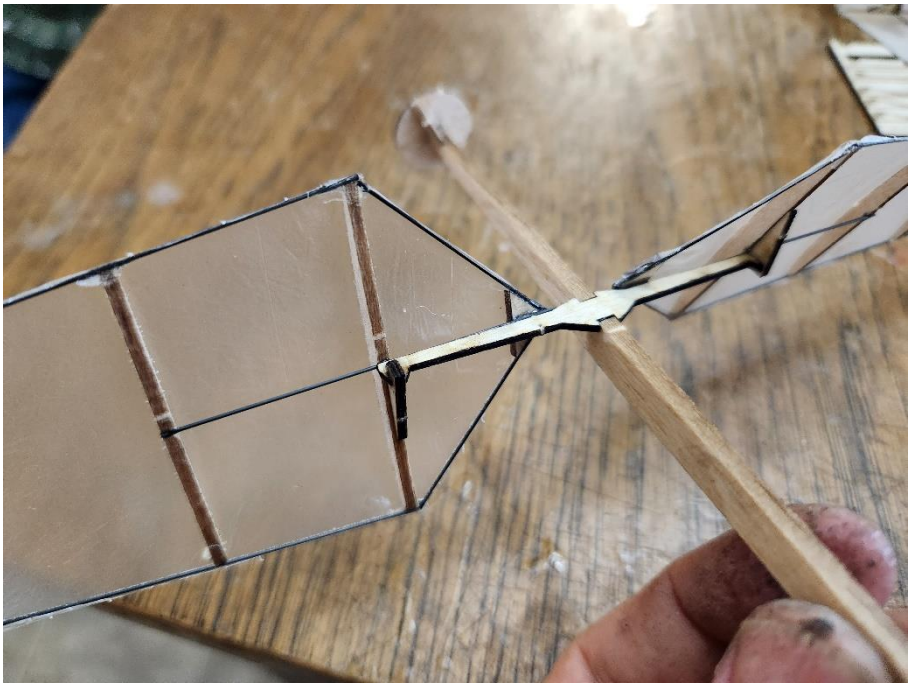
Bind the bearing firmly in place on the bottom end of the motorstick with thread, harden the thread with glue, and trim off the excess.

Insert the small end of the motorstick into one of the top caps.

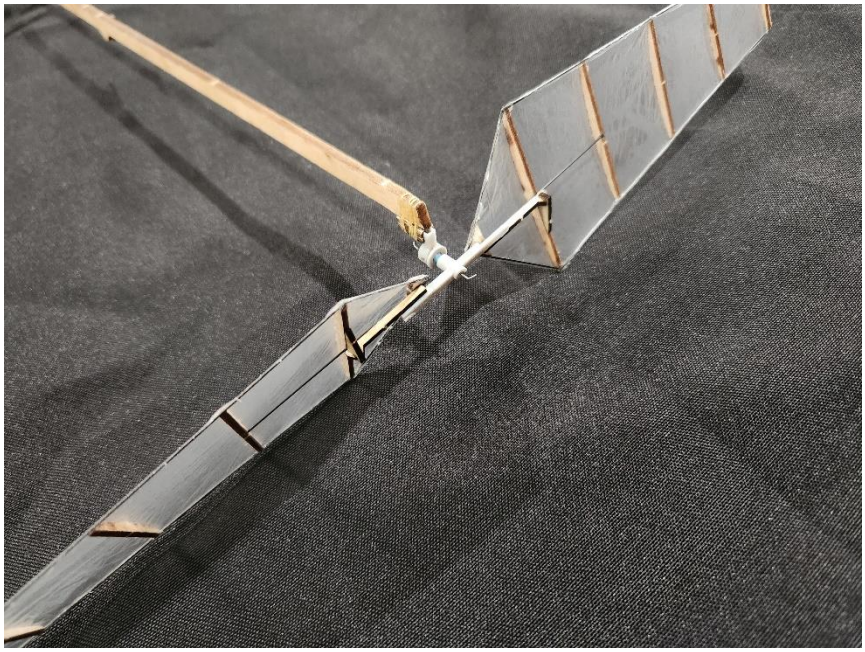


Add gussets on the sides of the cap as shown to prevent it from breaking along the grain (note the grain direction on the top cap).

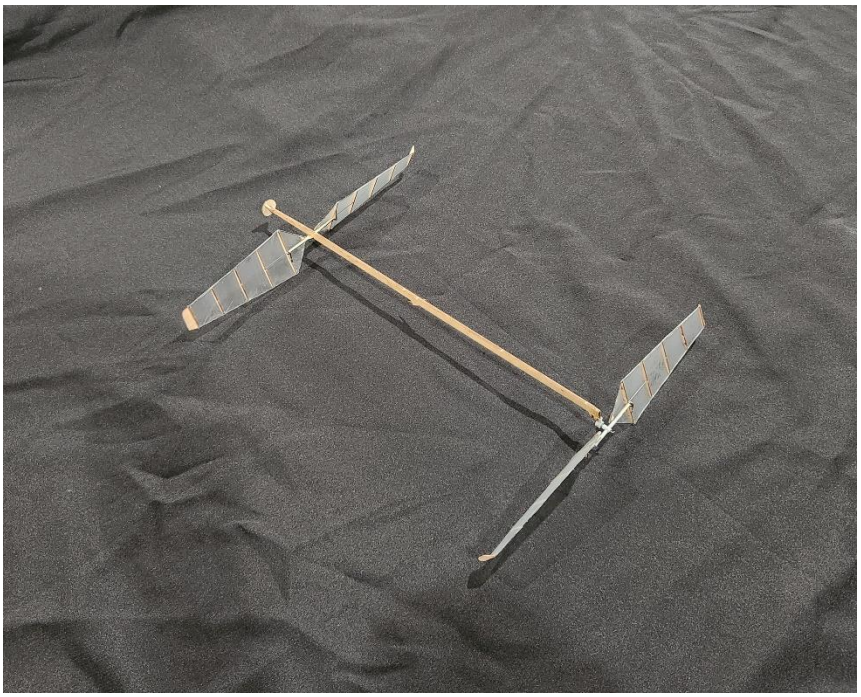
Attach the top rotor blade so that the covered, curved sides of the blades face toward the top cap.



Insert the bottom rotor bearing into the mounting ring. A small amount of tape on the bearing outside may help provide a tighter friction fit. Keep it just loose enough to be removable for storage and maintenance.



Congratulations!!! Your Tornado 2024 is now complete!

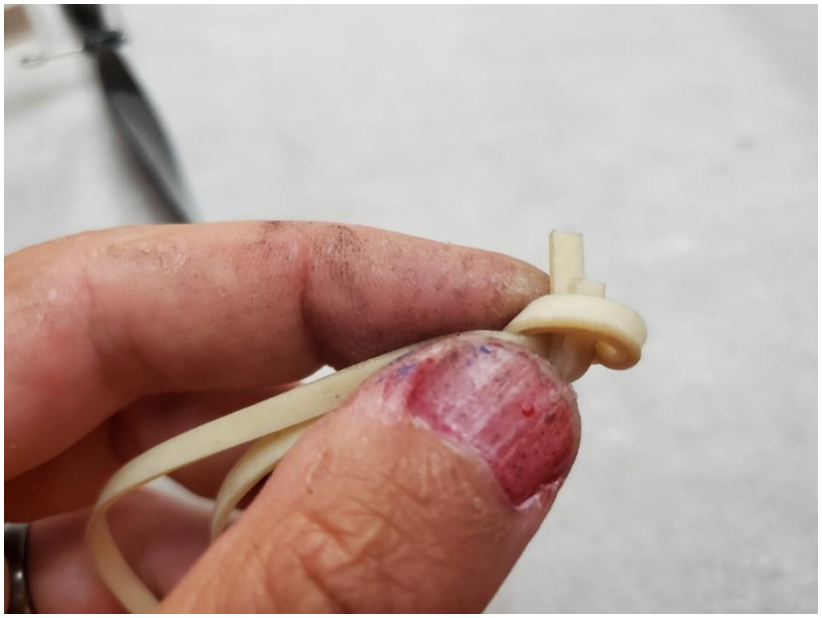


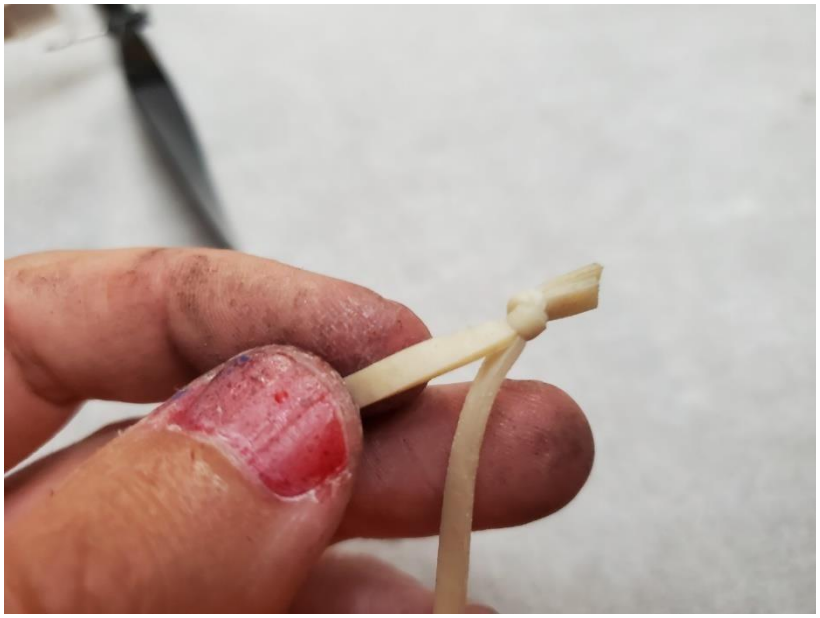
Weigh your model to verify that it meets the minimum weight of 4.00g. If not, glue clay to the top of the motorstick, above the top rotor.

Now you will need to make some rubber motors for it.

Cut a piece of rubber about 20 inches long (this is a good size to start with—you may find that longer loops are more optimal, but start with 20 inches). Slide two of the white plastic o-rings onto the rubber. Now you will need to tie a knot to join the ends of the rubber.

Bring the ends of the strip together and tie a granny knot as shown.





Tie a second granny knot and sinch it up to the first one for added security. Add a tiny dab of glue to the knot on the outside (free ends) of the rubber loop. Trim off any excess.

Now lubricate the rubber as shown by rubbing silicone oil into it. As mentioned before, do not use petroleum products to lubricate your rubber motor because they dissolve the rubber, making it unusable.

You can now load the rubber onto the rear hook and the prop shaft. Typically the rubber will be very slack, hanging loose under the model. It's ok for the rubber to hang loose, as this will actually reduce tension on the prop bearing and allow the rubber to be wound more tightly.

Wind the rubber motor, off the model in a clockwise direction using a hand crank winder. In the absence of a torque meter, the other end of the rubber motor can be secured using a bent paperclip around a chair leg. Start with 200-300 turns (not winder cranks—calculate this based on the gear ratio of your winder) Be careful when installing the rubber onto the model that the o rings does not slip off the bottom rotor shaft. This will take some experimenting to get it right.

If your model is correctly assembled, it should hover slightly or maybe gain a little altitude. Gradually increase the number of turns in the rubber motor until the helicopter rises to the ceiling, keeping record of you turns, torque, any turns you back off to remain clear of snags in the ceiling, and the model's overall performance.

Do not expect perfect flights from your model at first. If it does not perform correctly, verify that it is properly assembled and that you are winding in the correct direction. All model airplanes require subtle adjustments to get them flying their best. If your model crashes, never simply try to fly it again without taking time to figure out what made it crash and what can be done to correct it. Crashes can be caused by a poor launch (throwing too hard or too softly) or by the model being out of trim.

Please contact us using the contact form at jhaerospace.com or at joshuawfinn@gmail.com if you have any questions regarding your Tornado.

Want to become a pro at indoor flying? Try our Indoor Flight University curriculum. It contains extensive information on building, designing, and flying your airplanes to get the most out of them. Along the way you will learn a strong foundation of aerodynamic principles which will reveal the secrets of flight.

https://jhaerospace.com/product-category/curriculum/