

## The Flying Scrooge: Ornithopter of Household Items

by [royalestel](#) on March 23, 2007

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Author:royalestel [GoodCleanCrazy](#)

Every now and then I come up with a unique idea. And then I find someone else has already thought of it . . . which is AWESOME! Who knew there were so many kindred spirits on the web! YOU GO all o' us!

## Intro: The Flying Scrooge: Ornithopter of Household Items

This instructable will show you how to make a nifty flying model known as an ornithopter from cheap to free stuff.

An ornithopter is a lot like a model airplane, but it **flaps its wings** like a bird or an insect, and is a lovely sight to watch in flight.

This is pretty easy to build; you really only have to make sure the bearings are all parallel. Everything else can be crooked and this will STILL fly just fine. It is also VERY sturdy and can take many, many crashes without breaking. As an added bonus (and due to my personal tightwaddery) it is CHEAP. You can make this ornithopter out of household items. Mine cost about \$1.30 to make.

If you appreciate this instructable, please visit my blog for more ideas:

[GoodCleanCrazy](#)

### Supplies:

Bamboo Place Mat -- \$1 at the local dollar store. We bought one too many for our table.

Gel Super Glue -- \$1 for a 3 pack at the dollar store. Found it in a cupboard.

Plastic Grocery Bag -- Usually use them for tying up stinky diapers.

Coffee Filters -- Free from work (I don't drink coffee). And, no, I didn't steal them.

Paper Clips

Rubber Bands

Bic Pen

White School Glue

Clear Tape -- All free stuff I found lying around

### Optional:

CA accelerator -- \$4 at the local [hobby store](#). Sets super glue almost instantly.

### Tools:

Sharp Blade

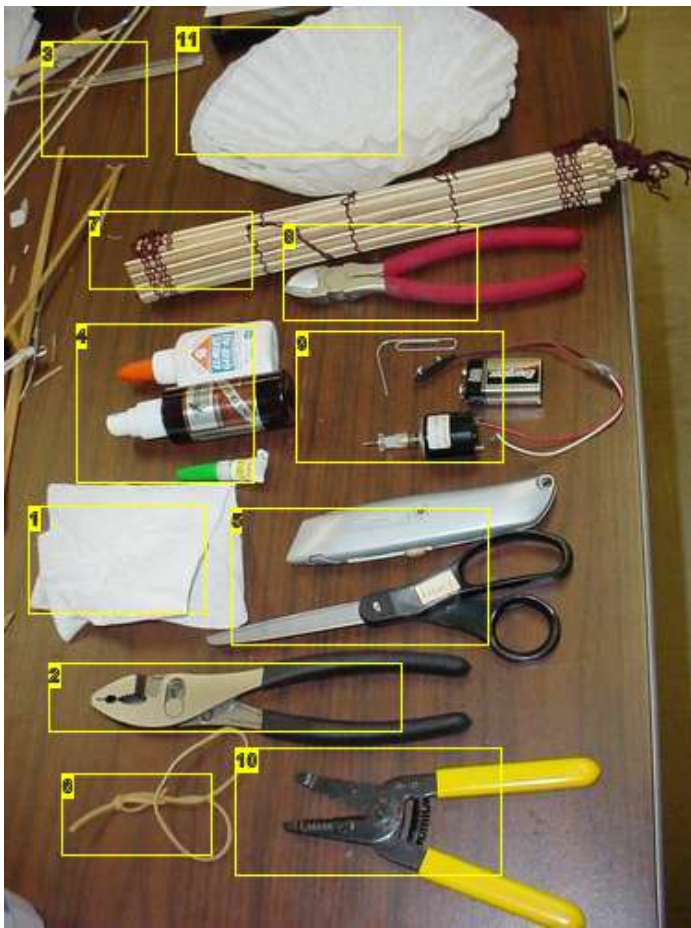
Diagonal Cutters

Scissors

Needlenosed pliers

Regular Pliers





#### Image Notes

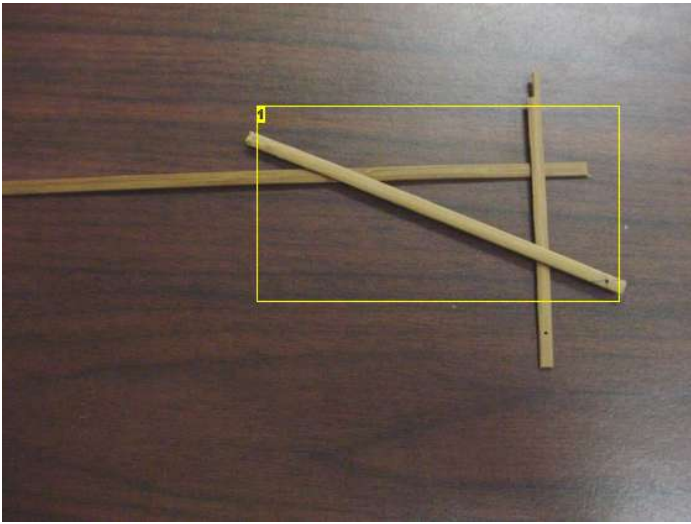
1. Paper towel.
2. Regular pliers.
3. (not shown) Plastic grocery bag for wings.
4. Glues and accelerator.
5. Sharp utility knife and scissors.
6. Long rubber band (the longer the better).
7. Bamboo place mat with flat strips for constructing the body with.
8. Diagonal cutters, also known as dikes.
9. Paperclip and a drill I made for this project.
10. Wire strippers, which I used as needlenosed pliers.
11. Coffee filters to reinforce joints with.

### Step 1: Assemble the Body

I looked up "ornithopter plans" on Google and can up with these plans. However, I wanted to make an ornithopter with four wings, like this. So I decided to base my ornithopter on the free bird plans, but modified it to make it four-winged and for use with my bamboo construction materials.

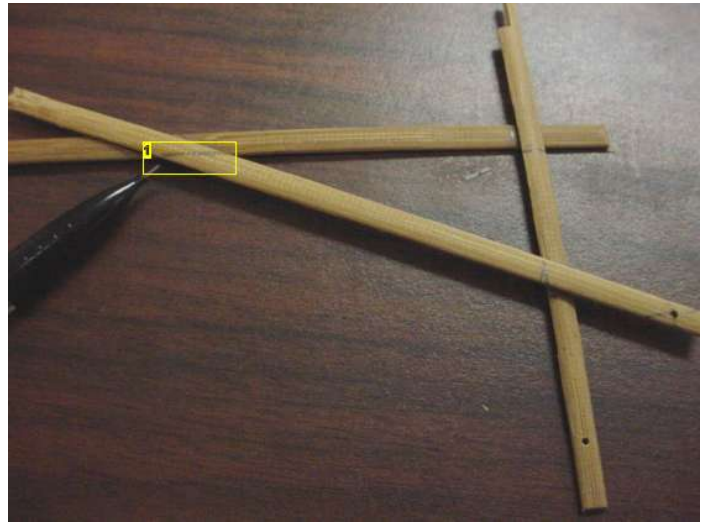
Start by removing some flat bamboo strips from the place mat and laying out the body shapes. I made some triangles. Using a pencil, carefully mark lines where they overlap. Cut along the lines with your dikes. *Carefully* clean up the edges with a knife. Glue together with a bit of superglue and spray with accelerator.

Continue for all the joints.



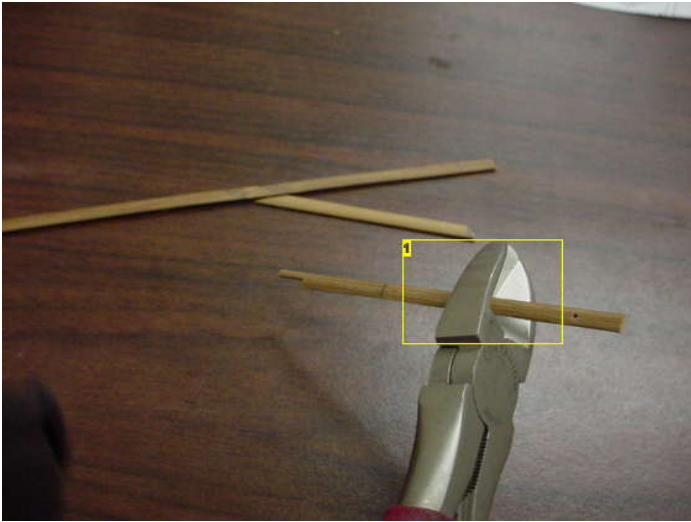
**Image Notes**

1. Layout your pieces. Triangles are strong shapes.



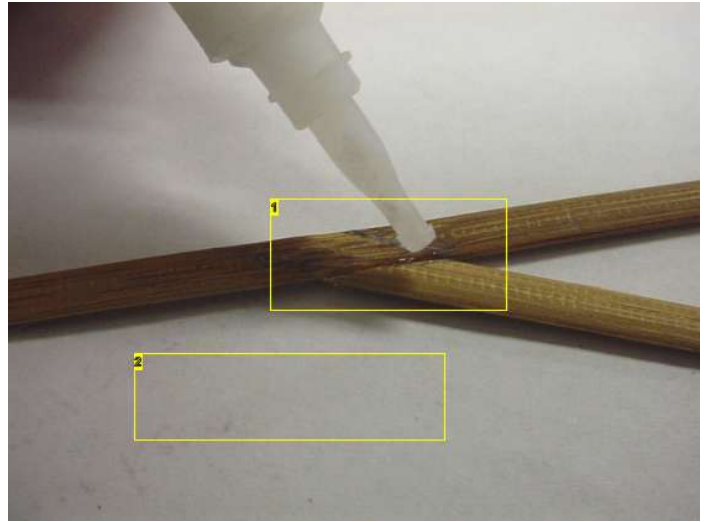
**Image Notes**

1. Draw lines where the pieces overlap.



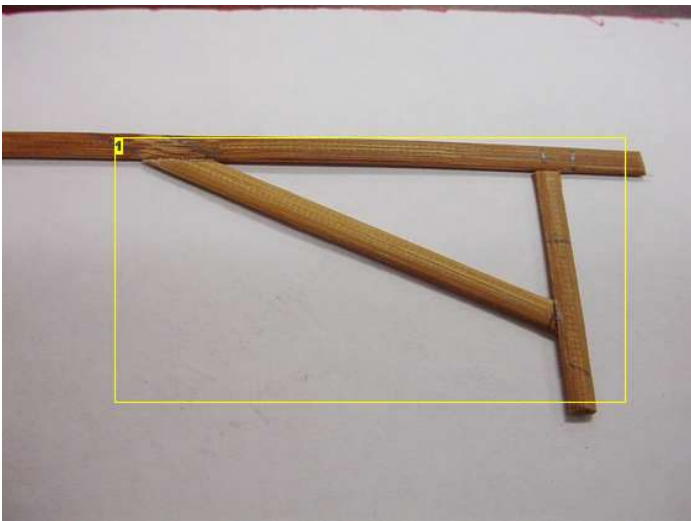
**Image Notes**

1. Carefully cut along the lines with your dikes.



**Image Notes**

1. Here I've just finished applying superglue to the joint.  
2. Do the gluing on a paper surface. If you spill, you can scrape off the paper. Waxed paper is even better.



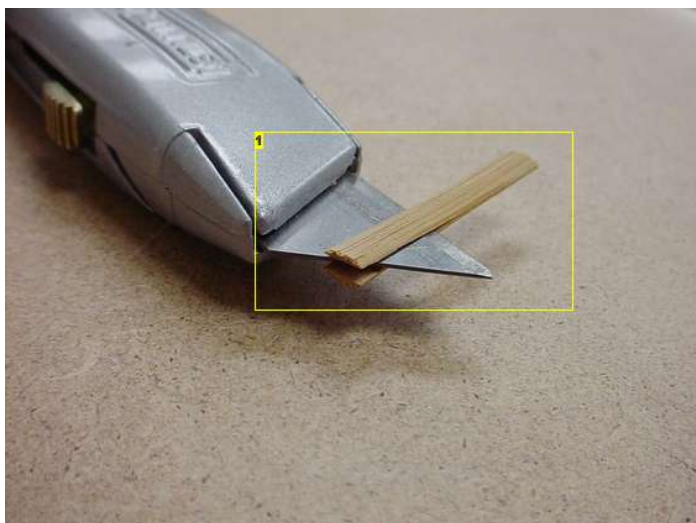
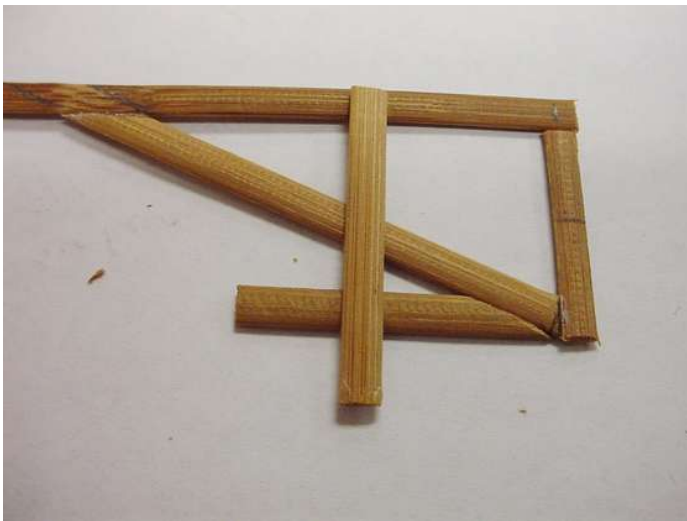
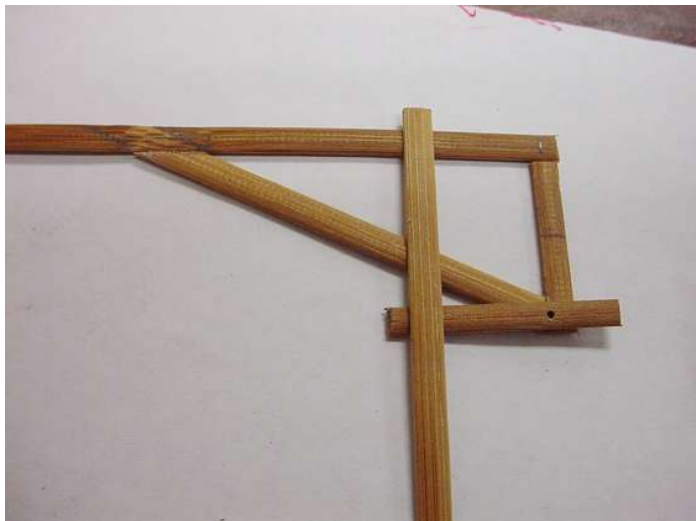
**Image Notes**

1. The triangle body all glued together.

## Step 2: Assemble Crank Supports

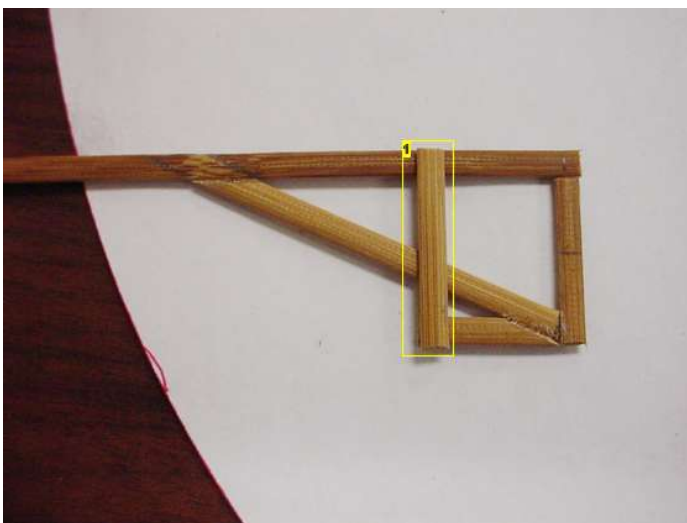
The top and bottom of the body need to be parallel, so add a few pieces to make the bottom rectangular.

I made some thin support pieces by cutting the bamboo in half lengthwise.



### Image Notes

1. Once you CAREFULLY start the cut, you can easily finish splitting the piece.



### Image Notes

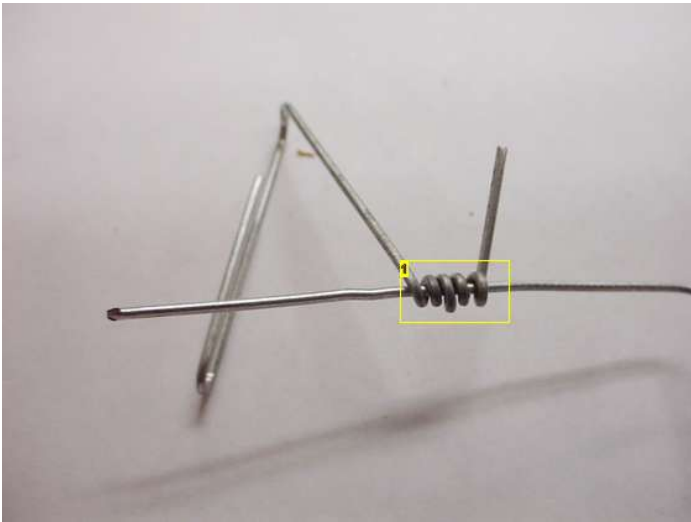
1. I glued a thin support on both sides of the body, instead of one thicker support.

## Step 3: Add Bearings

Make three bearings by wrapping a large paperclip around another large paperclip. Straighten the paperclips out before you begin. Coil the wire onto a small screwdriver or a drill bit that is slightly (slightly!) larger than the diameter of the paperclip wire. This slight diameter change allows the paperclip to rotate freely inside the coil. Clip off excess wire. Based on user feedback, it seems this step is harder than it appears. When you are done making your bearings, test them for smoothness of turning.

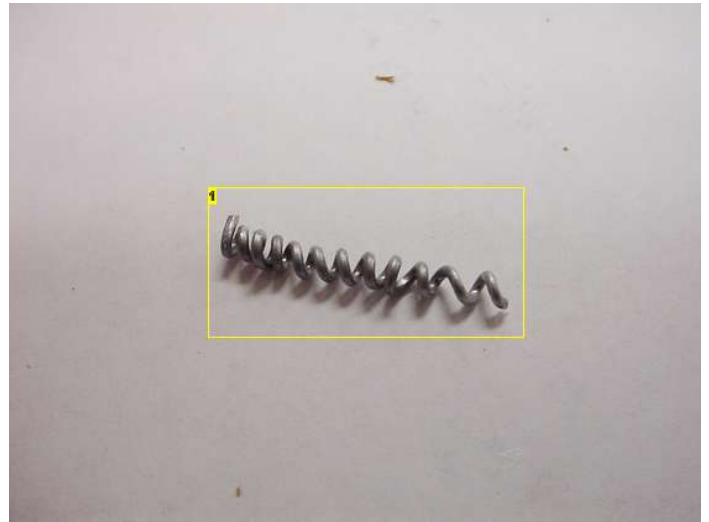
When you have three bearings, make some bearing support pieces as pictured. Glue a bearing to the bottom of the body. This is the main crank bearing. Glue two bearings to the top, side by side in the channels created by the support pieces. These are the wing bearings.

I found it helpful to slip a couple straight pieces of paperclip inside the bearings as I was positioning them. This helped me ensure they were all parallel.



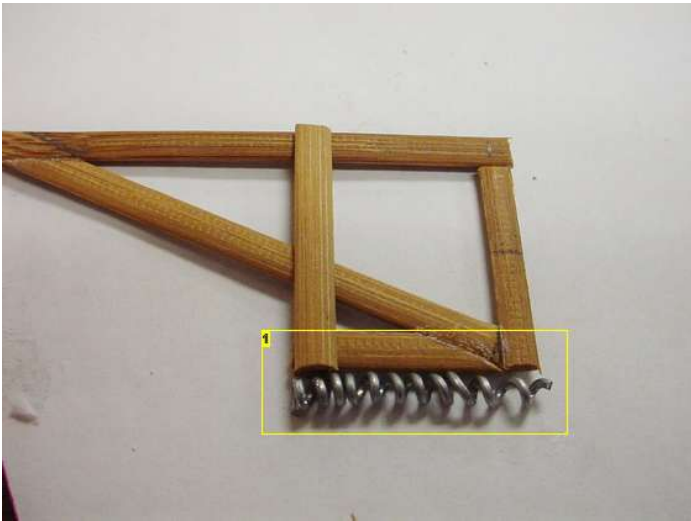
**Image Notes**

1. Wrapping the first bearing. Straighten your paperclip before coiling or you'll get bulging "knuckles" like you see in the third wrap of this coil.



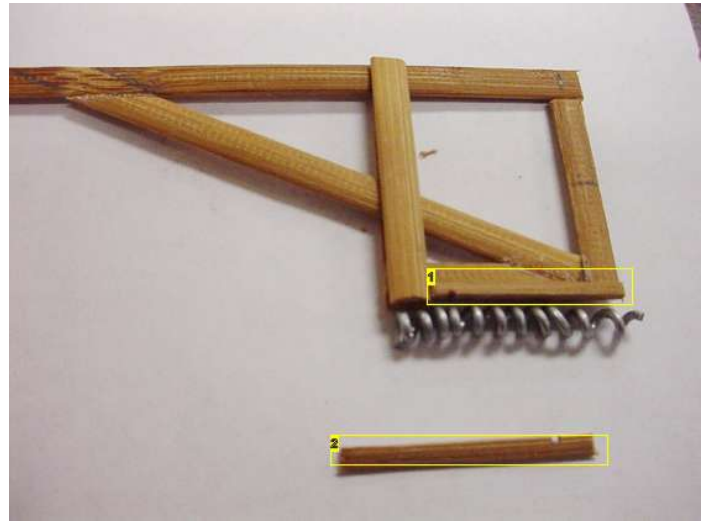
**Image Notes**

1. The finished coil. It's a bit crooked; This is also caused by not straightening the paperclips before winding.



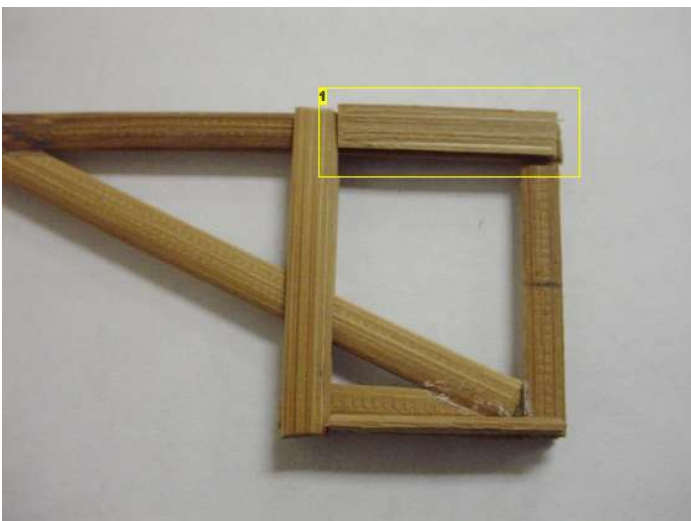
**Image Notes**

1. This is the crank shaft bearing. Add some supports before gluing to the body.



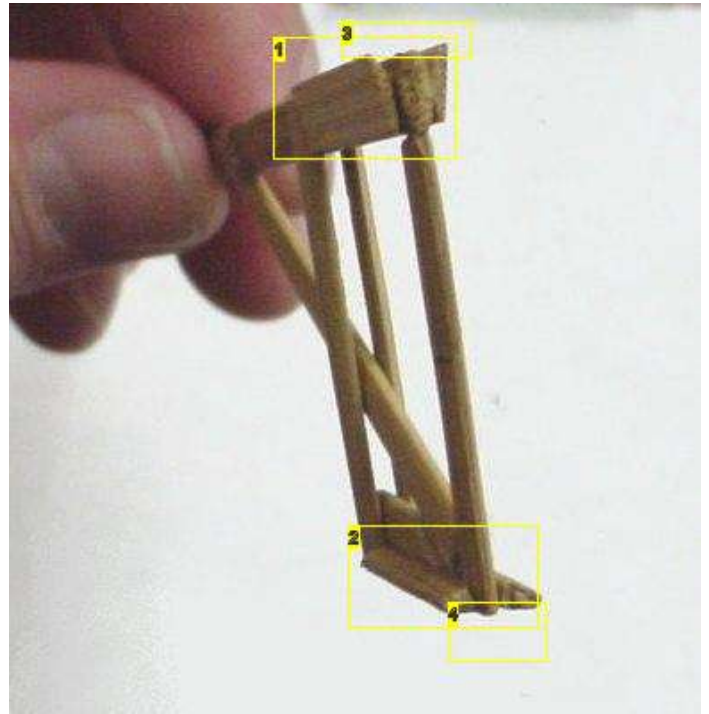
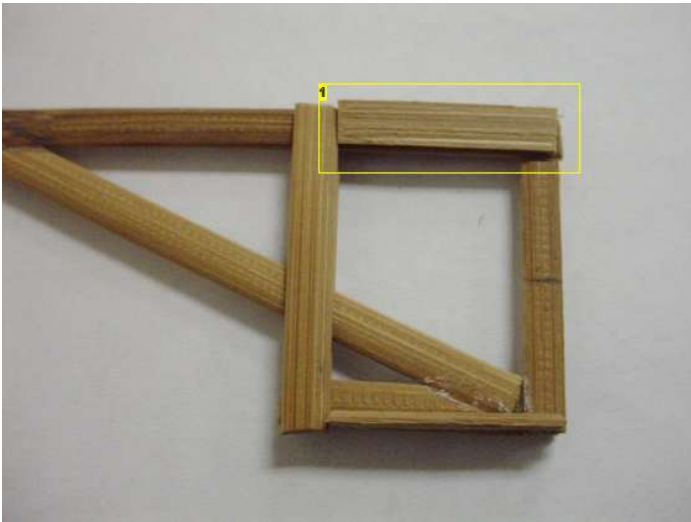
**Image Notes**

1. One of the supports for the crank bearing.  
2. The other support for the crank bearing. Glue it to the opposite side.



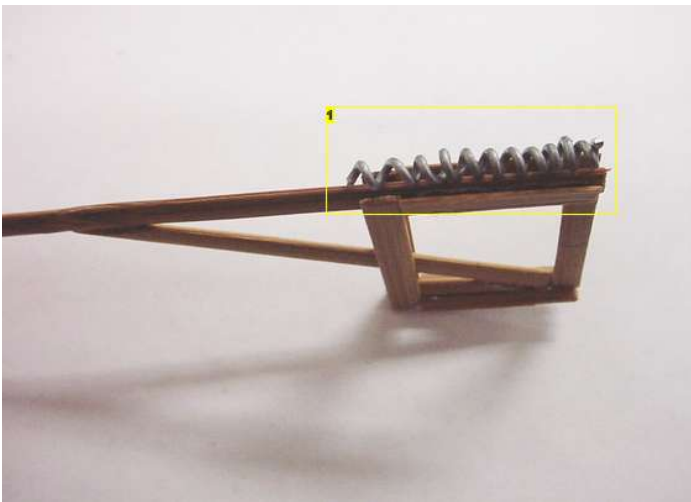
**Image Notes**

1. A half-thickness piece was glued flat-side out on both sides at this point.



**Image Notes**

1. Top wing bearing support pieces.
2. Bottom crank bearing support pieces.
3. The two wing arm bearings will be glued here.
4. The engine crank bearing will be glued here.

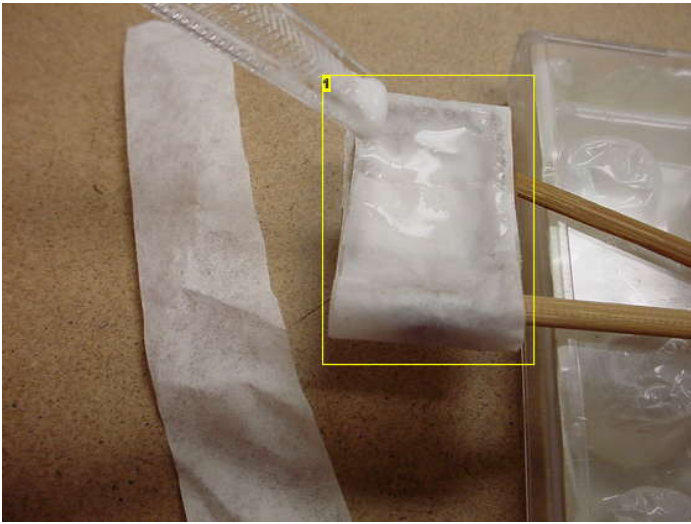


**Image Notes**

1. Adding one wing bearing . . .

**Step 4: Reinforce Your Joints**

Mix white glue half and half with water in a disposable cup. Cut out some rectangles of coffee filter tissue and glue onto the body, making sure that the tissue is thoroughly moistened with glue. Apply two layers. Let dry.



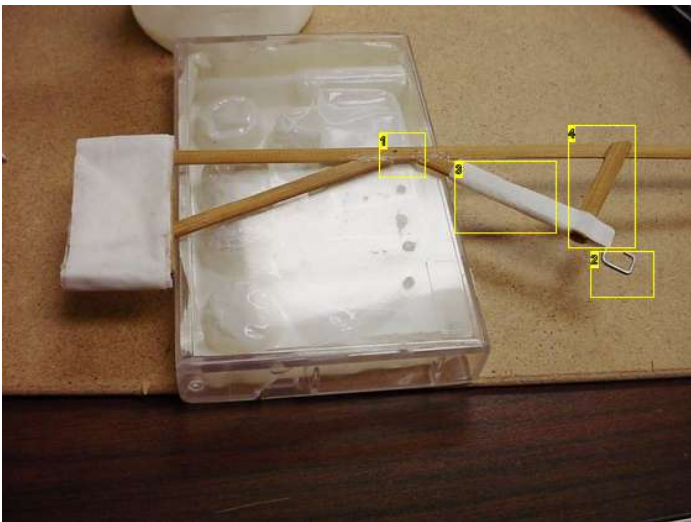
**Image Notes**

1. Applying glue to the filter paper to reinforce the joints. Two layers should be fine.

**Step 5: Finish the Body**

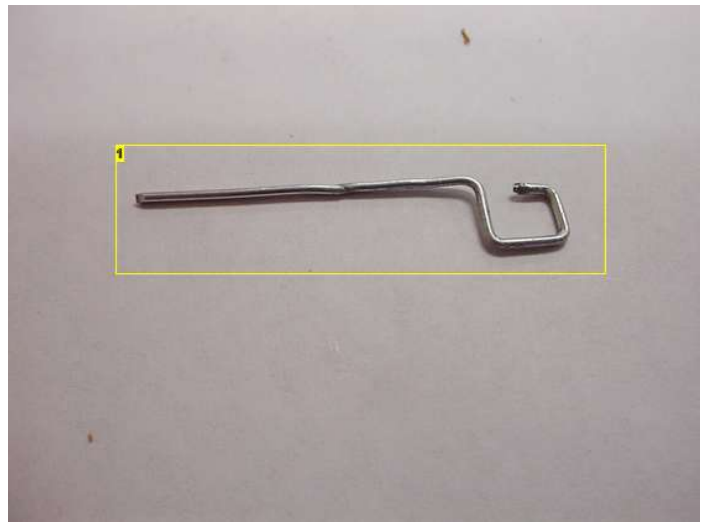
Finish the body using the photo as guidance. Add another triangle shape at the rear. The two rear spars are half-thickness to allow the tail hook to fit between. Form the tail hook from a large paperclip. Scuff the tail hook and superglue to the rear triangle. Reinforce tail hook with tissue paper.

After flying and crashing my ornithopter for several days, it broke right at the weak point between the triangles. So I added a third spar high enough to avoid the rubber band motion. I recommend you add one as well, as pictured.



**Image Notes**

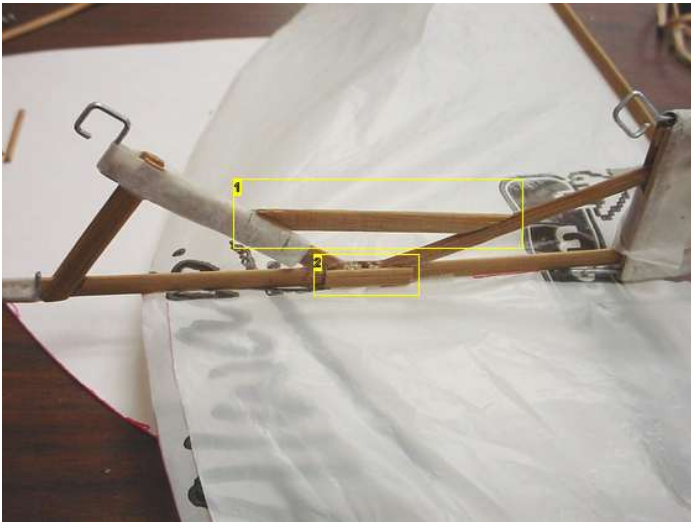
1. Weak point of the body.
2. The tail hook.
3. I added tissue in two directions for reinforcing the tail hook joint.
4. These spars are half-thickness to allow the tail hook to fit between them.



**Image Notes**

1. The pre-scuffed tail hook.





**Image Notes**

1. Extra spar.
2. I added these little support pieces after the body broke on the twentieth or so flight.

**Step 6: Make Wing Spars**

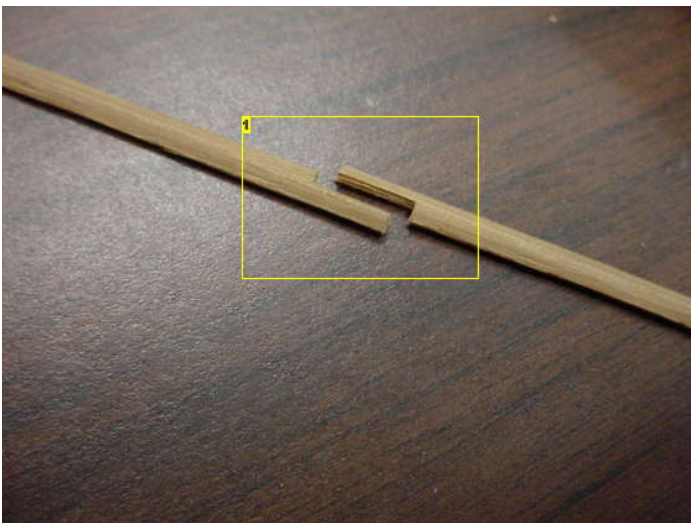
The wing spars need to be longer than any one piece of bamboo. Join two straight bamboo pieces together by cutting as shown and gluing. The stepped cut gives more surface area for the glue to grab, strengthening the joint. Reinforce the joint with tissue. Drill a small hole through the joint.

You can make a drill by squishing the end of a paper clip and cutting it at an angle with dikes. Bend into a stepped shape and hand crank away. I made a motorized drill for this project from a VCR motor I had lying around and a thumbtack. Super glue the tack to the motor, squish the tip with pliers, and cut at an angle. Attach to 9-volt battery. I found the VCR lying beside the road a few years ago and scavenged it for parts before I threw the case away.

Form two wing cranks from paperclips as pictured. The little "jog" in the left wing crank allows good wing movement. Insert cranks into wing spars and superglue in place. Reinforce with a layer of tissue. Take two smaller pieces of bamboo and drill several holes at regular intervals. These will be the adjustable arms.

Insert the left and then right wing spar and slide the adjustable arms onto the wing and main cranks. Test wing movement. You might have to add a piece of Bic ink tube as a spacer to one of the wing cranks for easy movement.

Disassemble wings and adjustable arms.



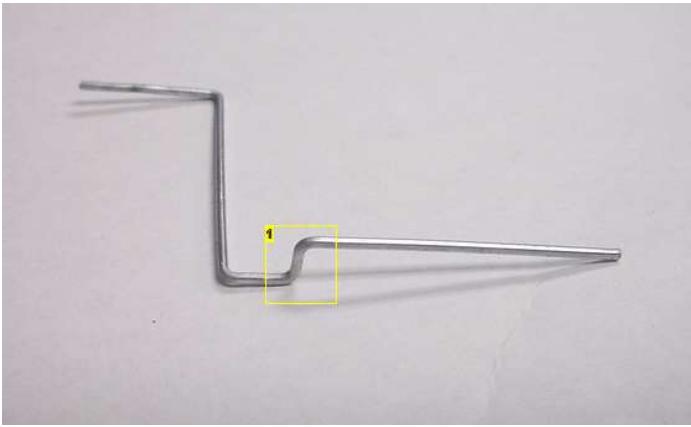
**Image Notes**

1. Cut the end of two spars like so and super glue together.



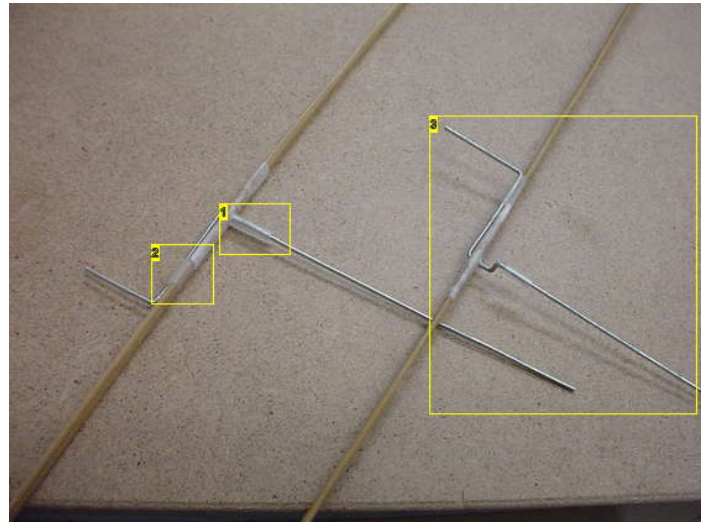
**Image Notes**

1. Tissue paper over the joints and let dry. Drill a small hole in the center.



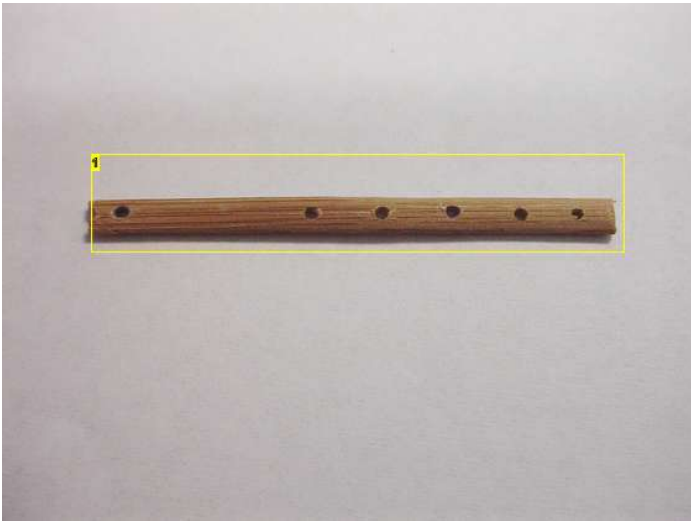
**Image Notes**

1. The "jog" in the left wing crank. All the bends in this wire are right angles.



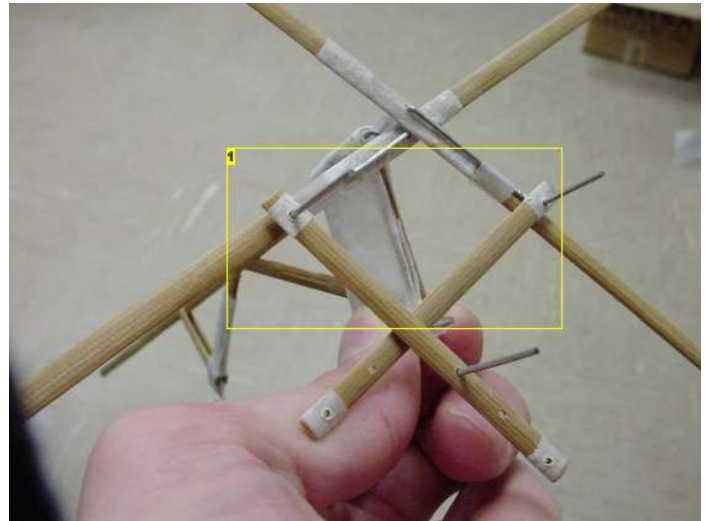
**Image Notes**

1. Section of Bic Pen tubing as a spacer.  
 2. Cranks taped in place temporarily. Super glue at this point and reinforce with tissue.  
 3. Left wing crank assembled.



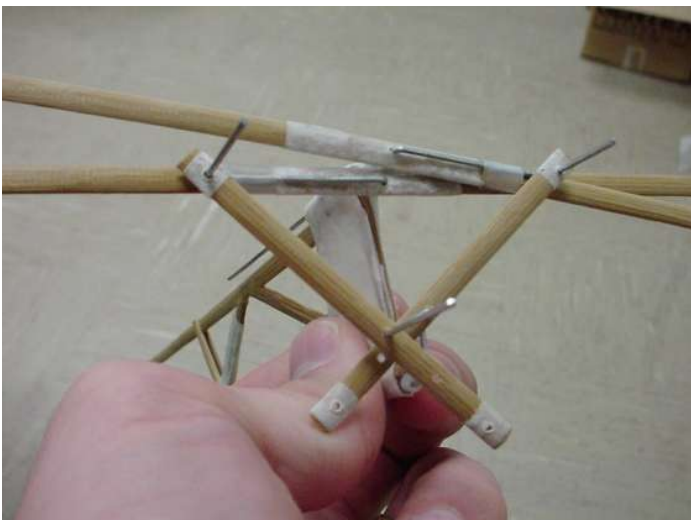
**Image Notes**

1. One of the adjustable arms I made.



**Image Notes**

1. Testing wing movement.



## Step 7: Make a Crank

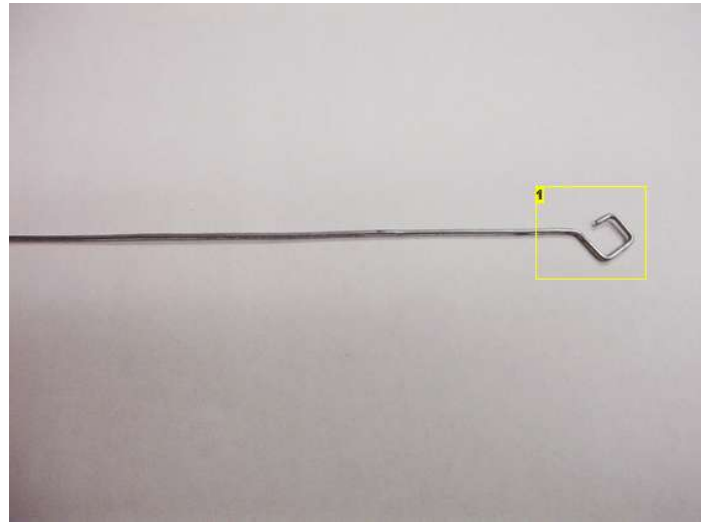
Straighten a paper clip and bend a hook on one end. Insert into the bottom bearing and bend a stepped shape (the crank handle) into it.

Make a bead for the crank from a Bic Pen. Pull a Bic pen apart with pliers. Cut off a few rings of the ink tube. Fill the rings with super glue and let dry. Slide one onto the crank handle and glue in place with super glue. Be sure not to get any glue on bearing.



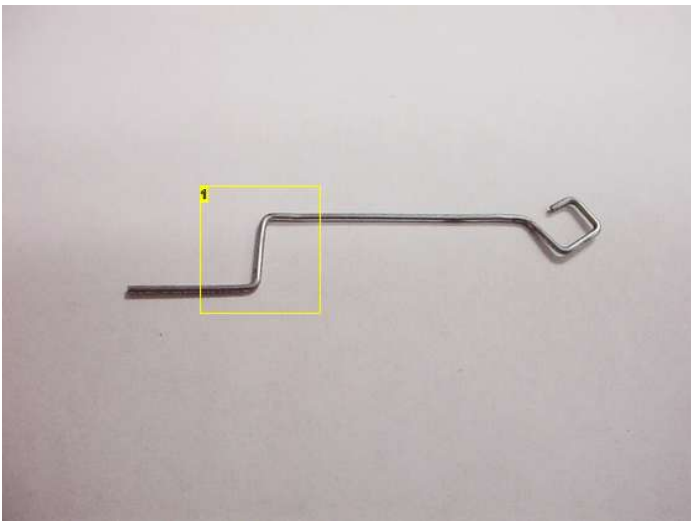
### Image Notes

1. Insert the straight crank BEFORE bending.



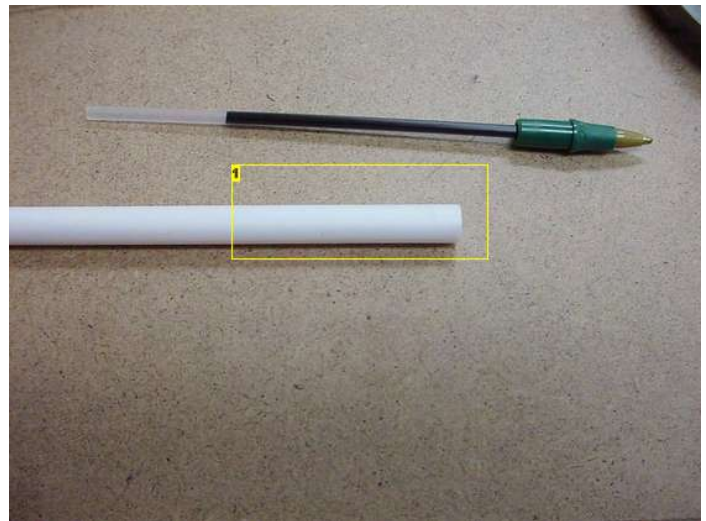
### Image Notes

1. Form the crank hook.



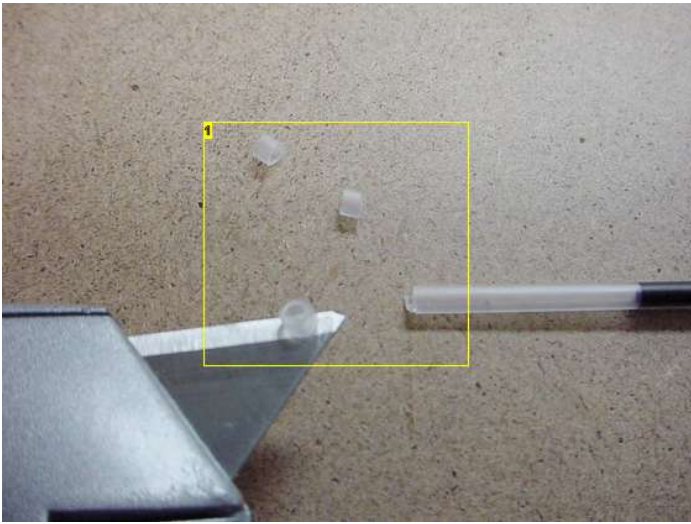
### Image Notes

1. Only add this bend AFTER inserting into the crank bearing.



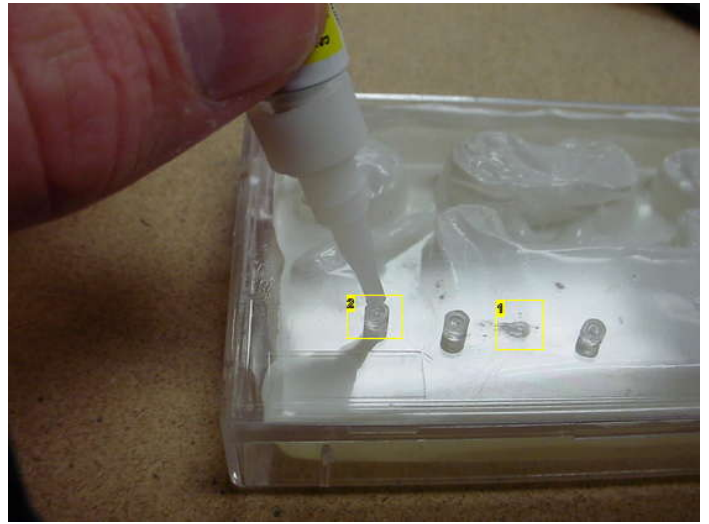
### Image Notes

1. Pull the Bic apart with pliers.



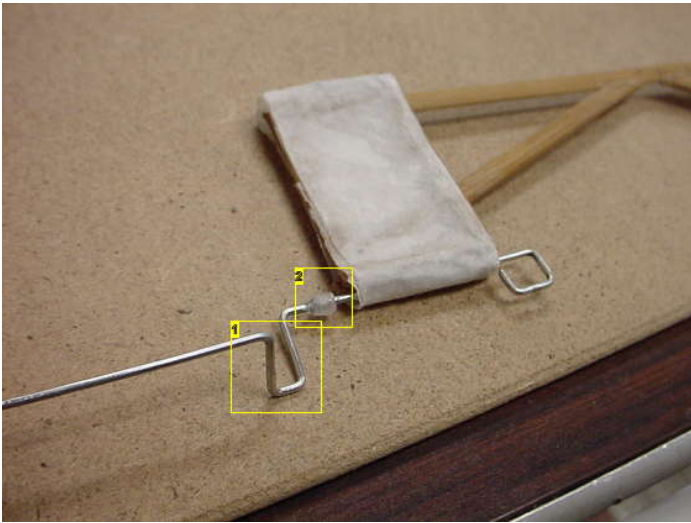
**Image Notes**

1. Cut small beads from the ink tube.



**Image Notes**

1. Glue residue from sliding a bead. You have to slide the beads around a bit to prevent them from sticking.
2. Fill beads with superglue.



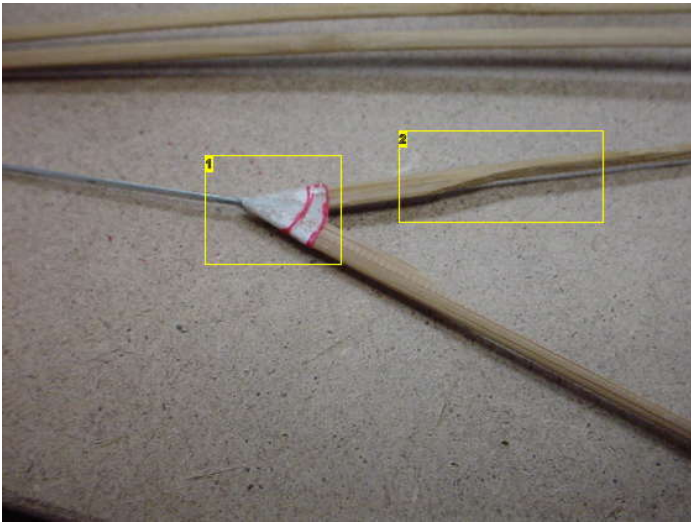
**Image Notes**

1. This was an alternative crank design that I tried (it didn't work).
2. The finished bead glued into place.

**Step 8: Make the Tail**

Save the outlines.jpg file attached to this step. Print it full size. {In Windows XP, right click on the file name and click "print". A dialog box will open. Keep clicking "Next" until it prints.} Cut out the tail section from the paper and trace onto the grocery bag. I taped my grocery bag to the back of a clipboard to have a smooth surface.

Using similar techniques as before, cut and glue two bamboo pieces together at an angle for the tail booms. I also thinned my tail booms to cut down on weight. Glue a large, straightened piece of paperclip as a tail boom. Cut a small circle out of tissue and reinforce the joint with it. Carefully cut the tail out of the grocery bag with a sharp knife. The tail should be about 6.5 inches long. Super glue the tail to the tail spars.



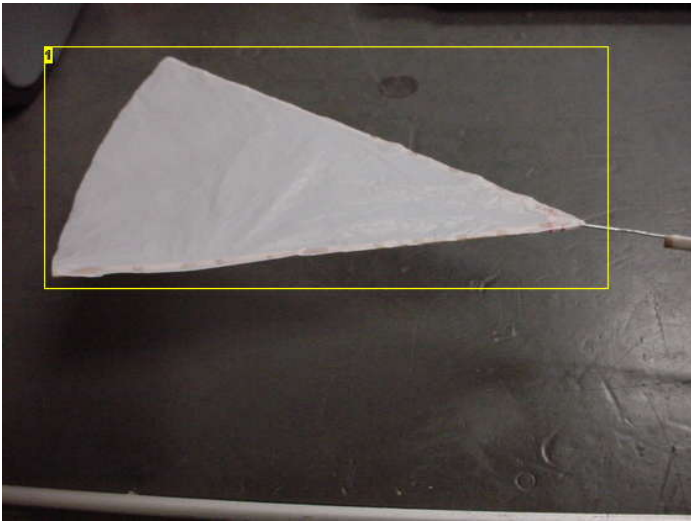
**Image Notes**

1. Reinforce the joint with a circle of filter paper.
2. I thinned the pieces with my knife.



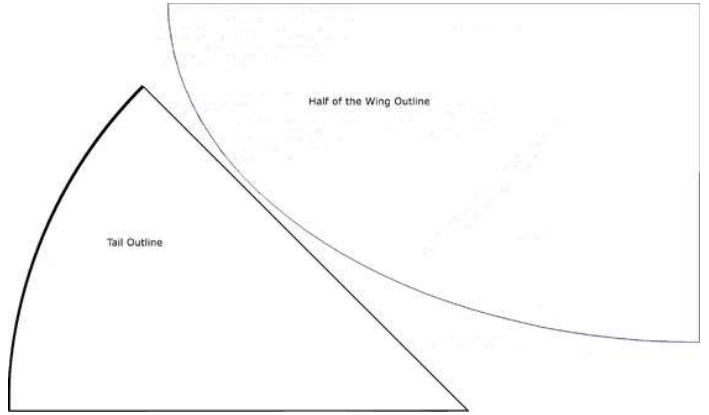
**Image Notes**

1. The cut tail piece.



**Image Notes**

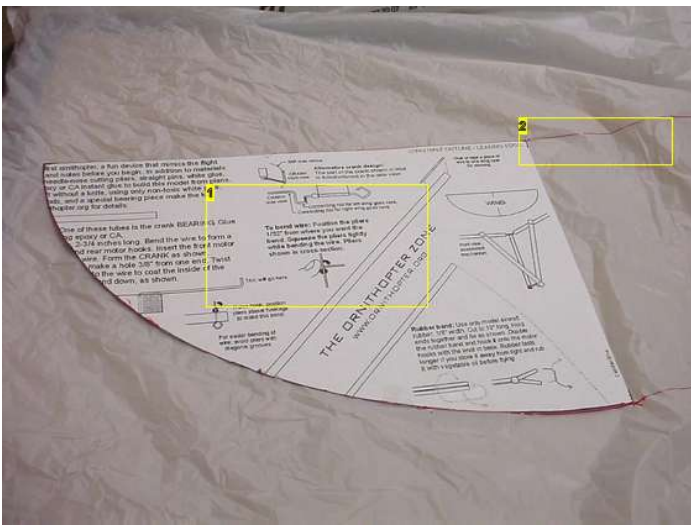
1. The completed tail piece.



**Step 9: Attach the Wings.**

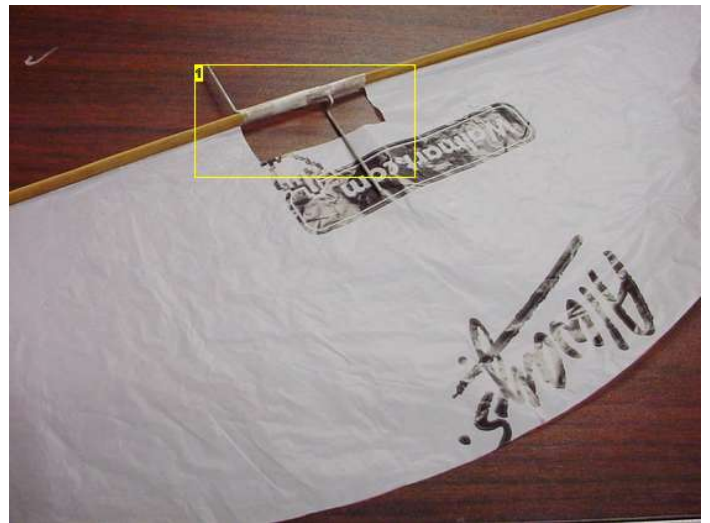
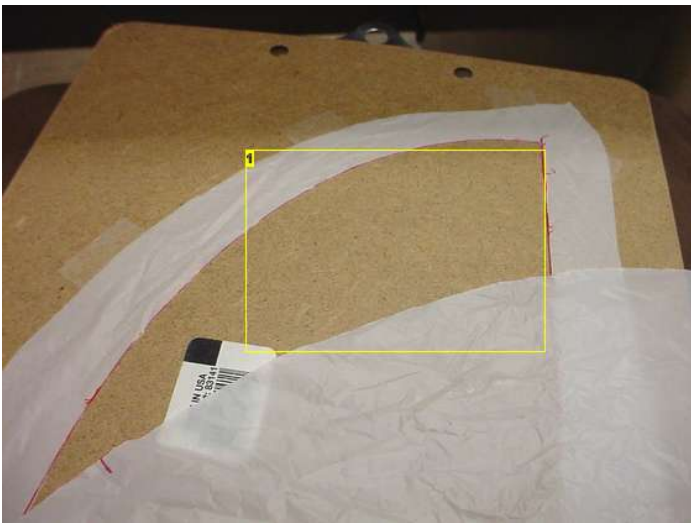
Cut out the wing outline from the paper you printed in the last step. Trace onto the grocery bag. Flip, and trace the other half of the wing. Trace a second wing the same way. Carefully cut out both wings. Cut a rectangle out at the middle of the straight edge of each wing piece. This allows the mechanics to move freely. Super glue the wings to the wing spars, starting at the center. Cut the right wing down the middle.

Insert the left wing into the left wing bearing. Insert the right wing and make sure that the wings can move freely. You might have to add a bit of ink tube as a spacer. When you have them moving well, remove the right wing. Glue the left wing to the "spine" of the body. Add the right wing and just tape the centerline of the wing flaps to the left wing.



**Image Notes**

1. I had to blow the original plans up a bit. I saved you that step by making the outlines.jpg file in the previous step.
2. One half previously traced.

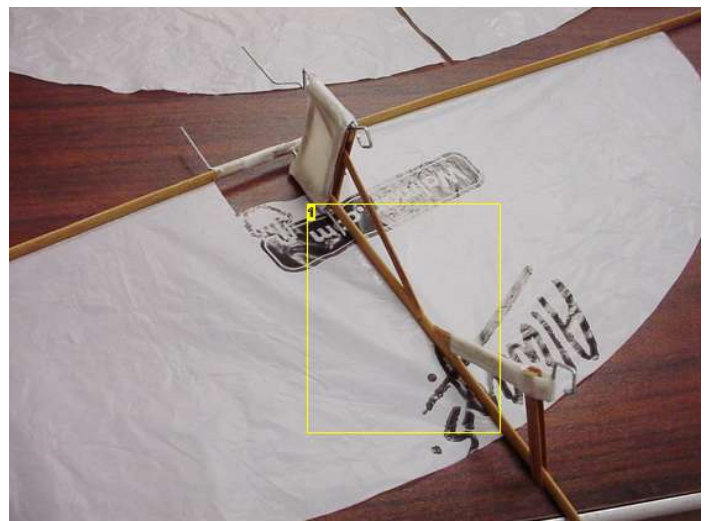
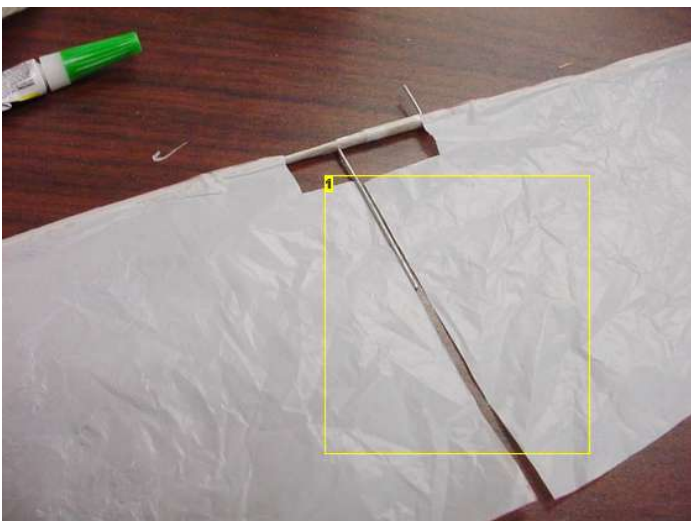


**Image Notes**

1. Cutting complete!

**Image Notes**

1. Cut out a rectangle like this from both wings.



**Image Notes**

1. After gluing the wings to the wing spars, cut the right wing down the middle like so.

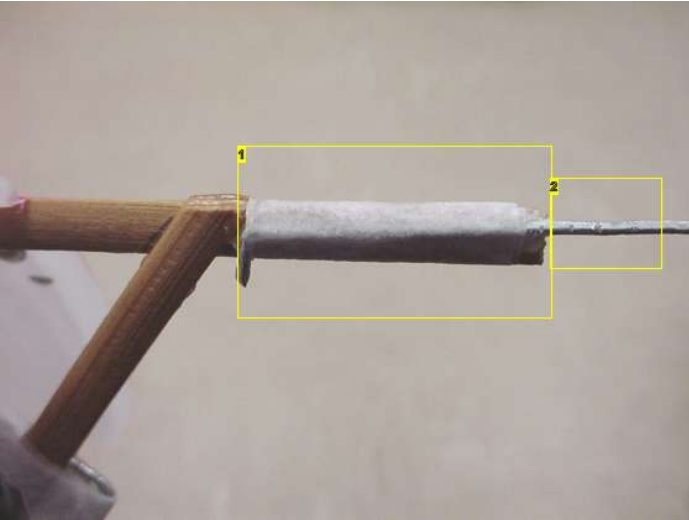
**Image Notes**

1. Glue the left wing to the body.

## Step 10: Final Assembly

Scuff up the tail boom with dikes and superglue to the body. Reinforce with filter paper. Using pliers, bend the tail boom up about ten degrees.

Hook a rubber band onto both hooks.



### Image Notes

1. Tail boom reinforced with paper.
2. Scuff marks.

## Step 11: Test Fly and Trim

Wind up your ornithopter and test fly it. Wind it clockwise and counterclockwise to see which direction gives you smoother movement.

Here's my second test flight:



If your ornithopter zooms upwards and stalls, try adjusting the tail boom down a bit. If it still stalls, you may need to tape a coin to the front of your 'thopter.

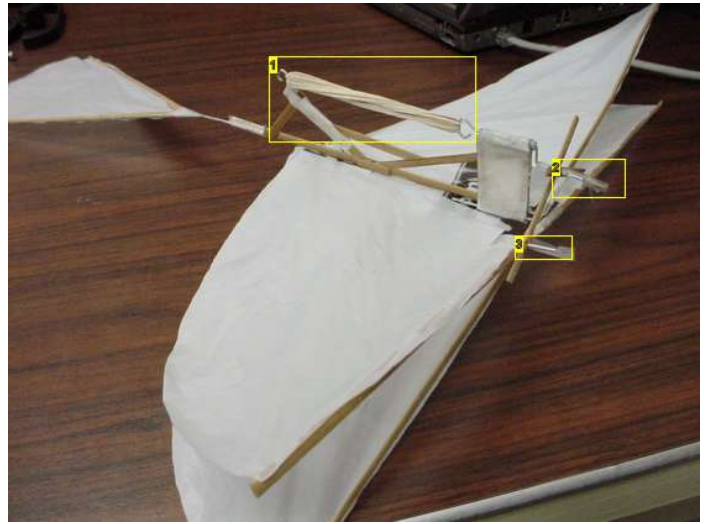
If it turns in a slow circle, you can tape a piece of wire to the wing tip on the outside of the turn. I left my wing spars long, and so I just cut off excess from the wing tips on the inside of the turn to fix that.

Experiment with different arm lengths (you know, the adjustable arm) and different rubber bands. I found that two or three narrow rubber bands gave me more consistent torque than one thick band (and also lasted longer).

Now go play with it! My daughters love watching this thing.

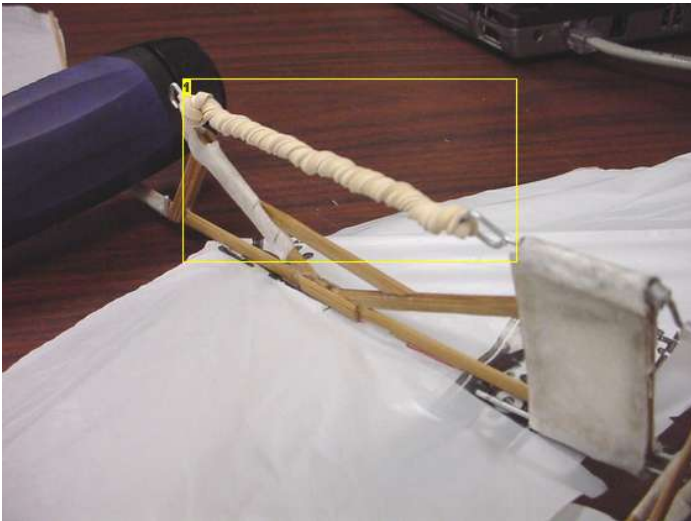
\*Update\*

I've added a couple pictures to show where to attach the rubber band (actually, I use four regular rubber bands at once) and where you wind it up.



**Image Notes**

1. The unwound rubber band engine.
2. This is the engine crank handle. You wind it up.
3. I put clear tape on the crank handle and both wing arms to keep everything together.



**Image Notes**

1. The wound rubber band engine.

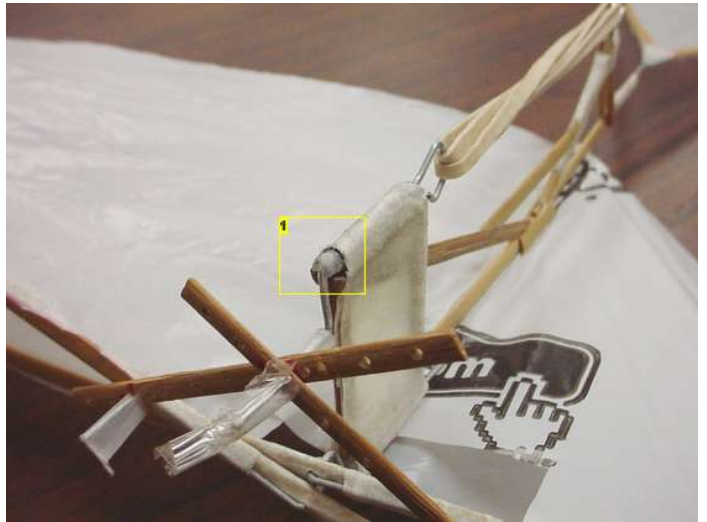
**Step 12: Bearing Pictures**

As per forum request, here are a few close-up pictures showing the wing and crank bearings in their final form.

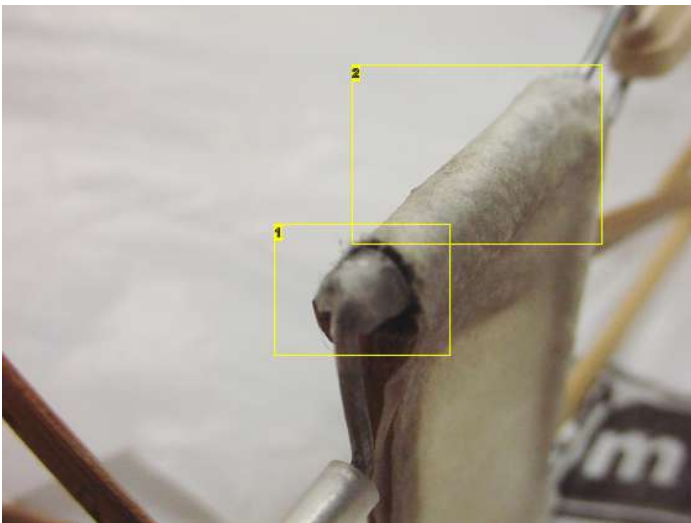




**Image Notes**  
1. Engine crank bearing.



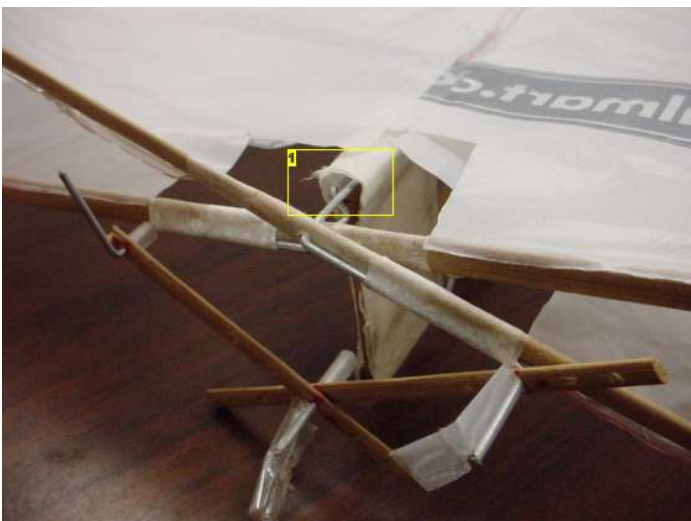
**Image Notes**  
1. Engine crank bearing.



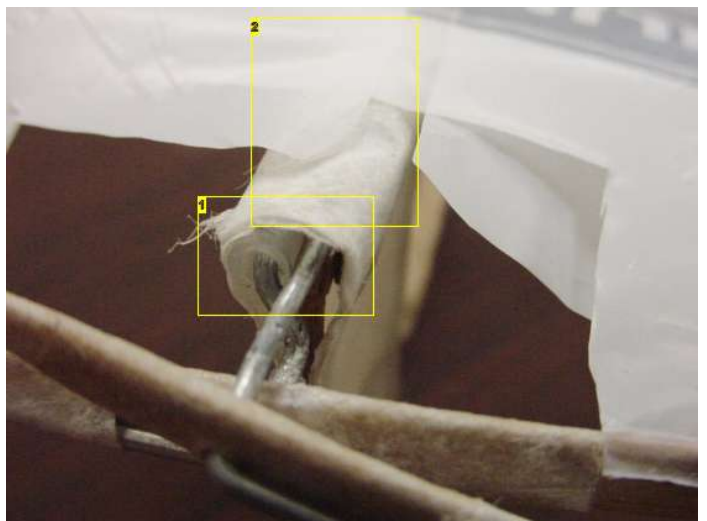
**Image Notes**  
1. Engine crank bearing. Here you can just see a section of pen tube I use as a spacer.  
2. The rest of the bearing is under this layer of glued filter paper.



**Image Notes**  
1. Wing arm bearings.



**Image Notes**  
1. Wing arm bearings.



**Image Notes**  
1. Wing arm bearings. You can just see a section of ink pen tubing that I use as a spacer protruding on the left.

2. The rest of the wing arm bearings are under a couple layers of glued tissue paper.

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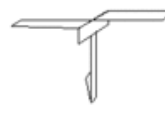
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## Comments

50 comments

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**intiguy** says:  
hey can we use a spring???????????

Mar 17, 2011. 3:50 AM [REPLY](#)



**BraisedDuck** says:  
rather than coiling maybe you can use a balloon stick,maybe?pls reply..

Sep 28, 2009. 7:08 AM [REPLY](#)



**goofy102938** says:  
great idea ive made 3 ornithopters and im sure that would work

Aug 31, 2010. 4:06 PM [REPLY](#)



**royalestel** says:  
What's a balloon stick? You mean, like a straw?

Sep 30, 2009. 12:13 PM [REPLY](#)



**goofy102938** says:  
instead of making the complicated paper clip bearing you can make a paper tube and super glue it and its practically like plastic

Aug 31, 2010. 4:05 PM [REPLY](#)



**chaoshawk** says:  
can you send me the plans at chaoshawk4@gmail.com thx (=

Aug 4, 2010. 12:55 AM [REPLY](#)



**Patented** says:  
Author's video have been remove, so here is another one I found made by Kipkay :  
[http://www.youtube.com/watch?v=e3wWfKEdvpY&feature=player\\_embedded](http://www.youtube.com/watch?v=e3wWfKEdvpY&feature=player_embedded)  
Skip to 2:50 for test flight !

Jul 12, 2010. 9:18 PM [REPLY](#)



**killer dragon** says:  
You **REALLY** need measurments

May 18, 2010. 3:25 PM [REPLY](#)



**dombeef** says:  
He said that the plans are from the free bird plans

Jun 16, 2010. 10:46 AM [REPLY](#)



**hyun20005** says:  
woo hoo!!! I made it! Awesome!

Apr 16, 2010. 5:12 AM [REPLY](#)



**dombeef** says:  
Can you make a video?

Jun 16, 2010. 10:25 AM [REPLY](#)



**hyun20005** says:  
Yes!!! almost finished!!! Thank you so much for this instructable. I just need to renew the spring that you make in step 3. When I turn the hook, it gets caught a bit. In other words, the movement isn't smooth.

Apr 14, 2010. 6:14 PM [REPLY](#)



**nirmalvasani** says:  
i only have round bamboo peicec. will the ornithopter still fly if the bamboo is rounded??

May 22, 2009. 9:03 AM [REPLY](#)



**hyun20005** says:  
**I also have only round bamboo pieces.**  
**I'm also wondering if this will work with them.**  
**I already started and I'm on Step 6 and I had no problem so far with my bamboo pieces being round.**

Apr 10, 2010. 8:41 AM [REPLY](#)



**andrew93** says:  
does it really fly??

Sep 2, 2007. 9:32 AM [REPLY](#)



**royalestel** says:  
Absolutely. It would fly longer and better if it had an electric motor instead of a rubber band, but it does indeed fly just fine.

Oct 3, 2007. 10:41 AM [REPLY](#)



**toxicwolf** says:  
adding the motor would be easy  
the real challenge would be adding a rudder to remote controll it you could use a miniature rc submarine motor and board or  
fust buy the havoc avenger and use the electronics from it as weel as rudder only problem is short range and a free flow rudder

Oct 16, 2009. 1:35 PM [REPLY](#)



**Mr.NHRA** says:  
The radio instillation would be easy! If some one made one of these i could convert it to an rc model in under 24 hours! The difference in my model from yours is that i would use servos and an ESC instead of cannibalizing an rc helicopter. I would totally make one of these but I am to impatient to glue all of those bamboo rods.

Oct 25, 2009. 4:42 PM [REPLY](#)



**ANDY!** says:  
i used a rc car to make a plane, but i broke the reciever I think.

Apr 9, 2010. 10:39 PM [REPLY](#)



**toxicwolf** says:  
first off you could use balsen wood and second the havoc avenger is an ornithopiter as well but the why it flies is hard to control and is adgetating

Oct 27, 2009. 3:13 PM [REPLY](#)

ps  
i tried it but i cant find it now



**hyun20005** says:  
Argh! Dis is so hard!!! Can anyone give me advice?  
Also, wat is the paperclip wire thingy for?

Apr 9, 2010. 3:18 PM [REPLY](#)



**blckthng** says:  
Awesome work man....i just wanted to know how small you could make one of these for it to function as an indoor ornithopter....toothpick size? and also can u make the frame with aluminum wire, its easier to bend and gluing with epoxy is faster and stronger. thanks

Jan 22, 2010. 4:10 AM [REPLY](#)



**ilikeicecreamandjuice** says:  
i dont get any of this


Jan 16, 2010. 5:40 PM [REPLY](#)





**killion01** says:  
were do you get this sticks?


Nov 24, 2009. 5:07 PM [REPLY](#)


 **BraidedDuck** says: Sep 28, 2009. 7:09 AM [REPLY](#)  
I just put too "maybes" in that sentence i'm so dumb!

 **varrok800** says: Sep 20, 2009. 7:19 PM [REPLY](#)  
I made one of these, and the wings won't flap. is it because the crank isn't straight?

 **varrok800** says: Sep 16, 2009. 4:21 PM [REPLY](#)  
sorry if i sound stupid, but how do you make the body? I don't understand

 **GreenAce92** says: Jan 22, 2009. 3:30 AM [REPLY](#)  
Really it can be however big you want it, just study some ornithopter designs and figure out how big of a crank you need, what size wings etc... the important thing is you need to build light, and strong... because there is lots of torque/power going through the body to flap the wings... and also it has got to be very light if you want it to really fly for a good time and make sure the wings flap in unison

 **GreenAce92** says: Apr 20, 2008. 3:53 PM [REPLY](#)  
i have made one of these before, except its a singlewing type, not dual. It flew only so far, they needed alot of torque to flap the wings. I have a vid of mine on youtube called Jacob's Ornithopter, its made of popsicle sticks lol.

 **pennym** says: Jan 21, 2009. 7:48 PM [REPLY](#)  
can anyone tell me the length of the sticks my son is trying to big one and no where is the measurements of anything can you please help

 **royalestel** says: Dec 5, 2007. 9:19 AM [REPLY](#)  
*Dear Royalestel,*

Congrats on your "ornithopter from household materials". To build one of these with such limited materials is a real accomplishment. I wanted to add a comment on your instructable, but it wasn't working, so I decided to send you a message.


Since a lot of people were looking for other plans and stuff, you might want to provide a link to <http://www.ornithopter.org> where there is a whole section of free plans for various designs.

(The "competition" link and also the "articles and plans" page both have several plans.)

Also, you should delete the comments from that "chirothopter" guy. Historically, the word "ornithopter" refers to any flapping-wing flying device, not just ones that have "feathers". He's only going to confuse people by trying to divide these machines into different categories. Besides, he didn't even construct the term properly: It should be "chiropter" without the "th".


Nathan Chronister  
The Ornithopter Zone

PM'd to me and reposted here for everyone's benefit. The link is especially handy!

 **budsiskos** says: Mar 6, 2008. 10:14 PM [REPLY](#)  
i have been meaning to reply to you for some time now so sorry for the late comment. I will agree with you that ornithopter is a very generalized term that is used to describe a flapping fying machine. however, if you disect the word you will end up with orni(bird) and thopter(flapping machine) and when the word chiroptera(bat) is disected you find chiro(hand) and ptera(wing) and when put together you end up with chirothopter and not chiropter as the word opter has no meaning without a prefix or suffix. so, if the roots are taken literally enough you end up with the three main groups of flapping machines: entomopter,chirothopter, and ornithopter and that's if you do not consider helicopters as flapping. i will also agree with you that this will confuse people and i am sorry for that. but, for those of us it does not confuse, this is very interesting peice of information and thats all im trying to make it into. i am not suggesting we change every book and website using ornithopter to the more specific term.

 **gun** says: Jan 31, 2008. 3:01 PM [REPLY](#)  
looks sweet!!!! Dude :-)

 **sb123** says: Jan 21, 2008. 10:56 AM [REPLY](#)  
great instructable!

 **asdfghjkl** says: Dec 2, 2007. 6:46 PM [REPLY](#)  
I have a tip for other people making the coil, wrap the paper clip around a small screwdriver, this makes it soo much easier.



**royalestel** says:

You know, I'll add that to the instructable. Another builder wound the wire around a small drill bit.

Dec 3, 2007. 12:53 PM [REPLY](#)



**budsiskos** says:

technically its a **chirothopter** (*mechanical bat*) because it has no feathers and a mechanical insect would be called an **entomopter** (*mechanical insect*)

Nov 18, 2007. 12:02 PM [REPLY](#)



**royalestel** says:

Well, cool! Didn't know that. Have you ever made any actual ornithopters?

Nov 19, 2007. 2:35 PM [REPLY](#)



**budsiskos** says:

i have not made any *ornithopters*, though i did just recently finish a *chirothopter* and will begin work on an instructable within the week.

Nov 20, 2007. 9:07 PM [REPLY](#)



**royalestel** says:

Cool! Love to see it!

Nov 21, 2007. 4:13 AM [REPLY](#)



**budsiskos** says:

i just finished the instructable for my chirothopter  
here's the link <http://www.instructables.com/id/make-an-ornithopterchirothopter/>

Dec 1, 2007. 10:45 AM [REPLY](#)



**vt93** says:

it would be better if there were measurments

Nov 14, 2007. 12:26 PM [REPLY](#)



**royalestel** says:

Y'know, you're absolutely right. It's on my to do list.

Nov 14, 2007. 2:39 PM [REPLY](#)



**threecheersfornick** says:

Hmm... looks fantastic, but I'm after a two-winged one. Any suggestions?

Oct 20, 2007. 6:07 PM [REPLY](#)



**royalestel** says:

Right Here.

Oct 21, 2007. 6:40 PM [REPLY](#)



**Kiteman** says:

Nice instructable. Making an ornithopter has been on my "to do" list for a couple of years now.

("Cutting edge", though? Ever heard of Da Vinci? <http://www.flyingmachines.org/davi.html> )

Mar 26, 2007. 5:19 PM [REPLY](#)



**royalestel** says:

Ah, got so much guff about the "cutting edge" phrase I dropped it.

Jul 11, 2007. 11:13 AM [REPLY](#)



**royalestel** says:

Oh yeah, it's the four-winged part of this that is cutting edge. I forgot about that.

Mar 27, 2007. 7:43 AM [REPLY](#)



**royalestel** says:

Well . . . they're on the rise again, baby! Smart-alec.

Mar 26, 2007. 7:10 PM [REPLY](#)



**Kiteman** says:

Yeh - *here* is a truly cutting-edge ornithopter: <http://www.instructables.com/forum/TBRDQU7F4HZY529/>

Now, *who* won that lasercutter...?

Jul 24, 2007. 4:16 PM [REPLY](#)

[view all 96 comments](#)