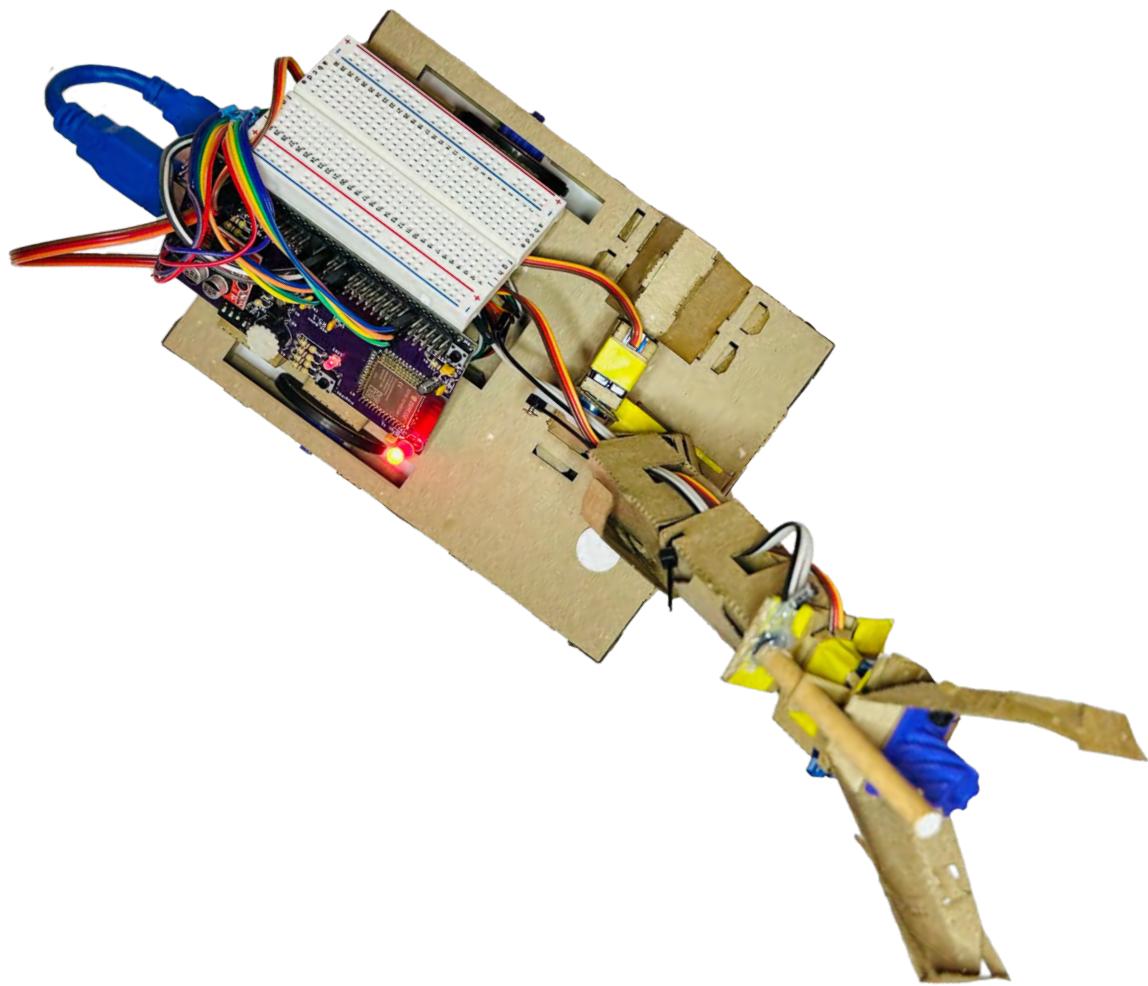


MSEbot Build Instructions—Part 2

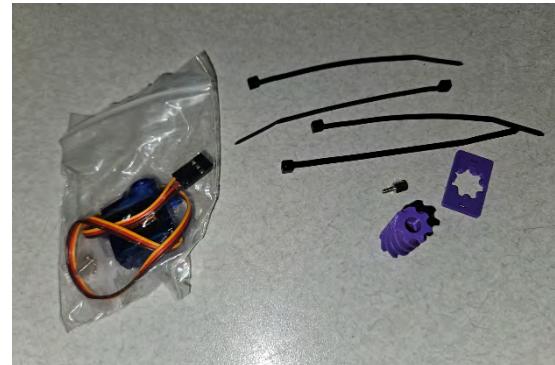


- 1) DON'T fold more than needed as this will cause material fatigue and most bends are on the dotted lines.
- 2) When pulling on the tabs with needle nose plier, always hold the piece with the slots firmly to the table behind the pulling direction or between your fingers.



- 3) In the flat part drawings, the coloured lines mean:
 - a. ——— Black line (dotted or not): Indicates which lines the step is referring to.
 - b. —— Blue Dotted Lines: Fold towards you (out of page) in reference to the flat part orientation shown.
 - c. —— Pink Dotted Lines: Fold away from you (into the page) in reference to the flat part orientation.
 - d. —— Pink Solid lines: Same fold as pink dotted line but no fold indication on real part.
 - e. —— Blue Solid lines: Same fold as blue dotted line but no fold indication on real part.

- 4) Find these parts in your kit.



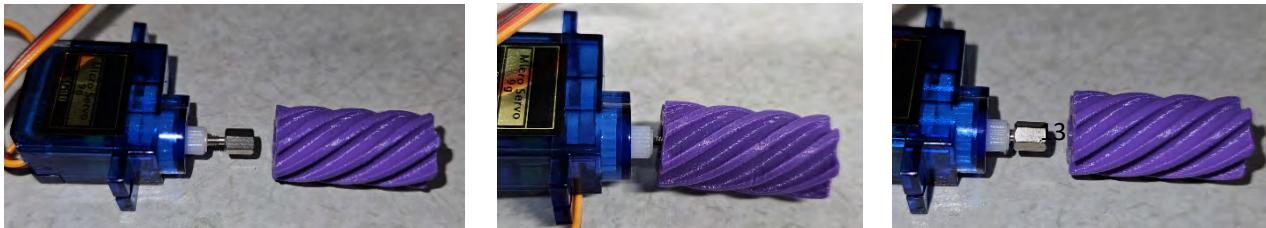
- 5) Remove the servo from its bag and start to thread the hex stand off into the servo end.



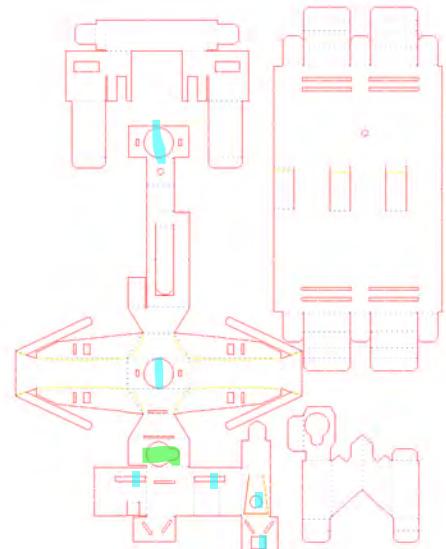
- 6) Looking at the lead screw, one end has a flatter outer edge and the other has a more beveled outer edge. Test which side you can easily put on the lead screw nut. This end should face away from the servo. Flat side toward servo.



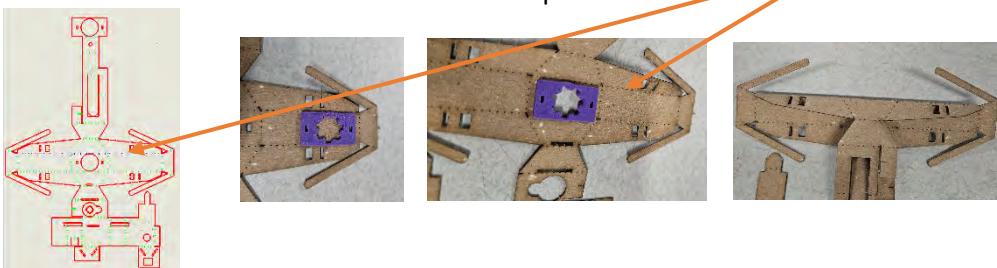
- 7) Start the hex standoff with your fingers. You might only get it on just. If necessary, use a hand drill to slightly open the hole, only drilling a couple of millimetres deep. Slide the lead screw over the hex standoff then slowly turn the lead screw clockwise until the hex standoff threads are fully in the servo. (rounded side seems to engage with screw more easily)



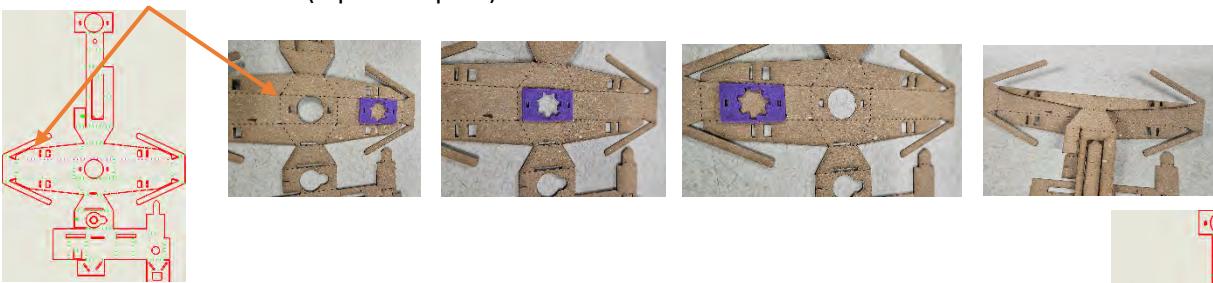
- 8) Remove Component 13 (the claw) from its sheet and clear these holes. Remove this **hole** but keep the removed cardboard. Put it aside you will need it later in Step 44.



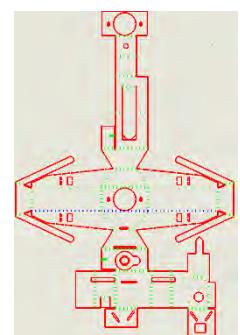
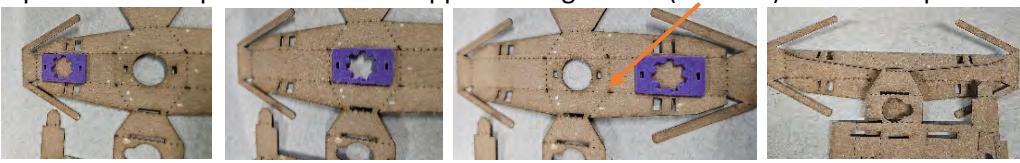
- 9) With Component 13 in the orientation shown and using the lead screw nut as a straight edge (you can use a ruler if you have one). Carefully fold this dotted line 180°. Unfold to flat for the next step.



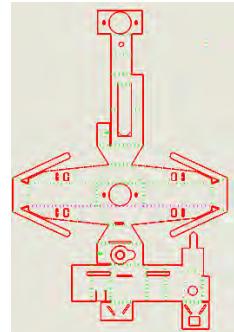
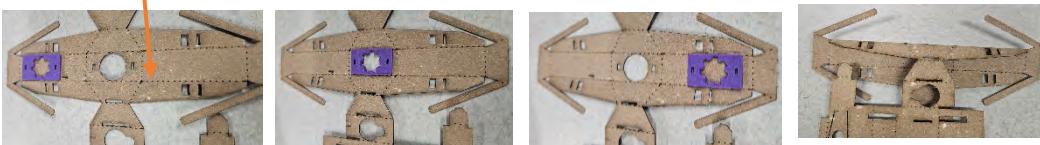
- 10) Then fold backwards 180° (flip and repeat)



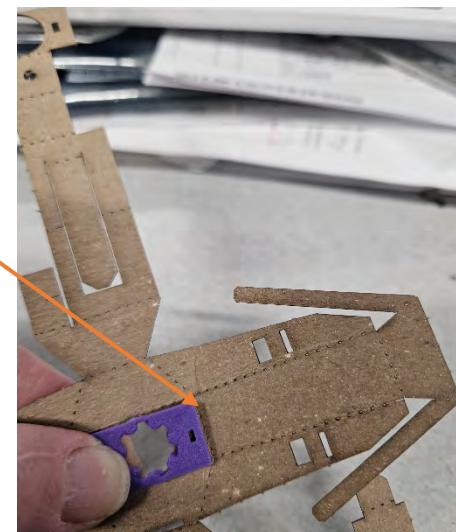
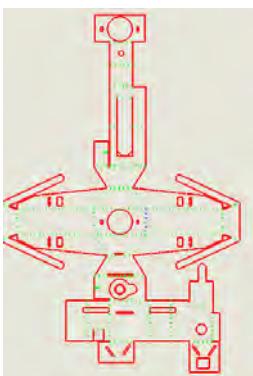
- 11) Repeat the same procedure on the opposite long dotted (this one) line of Component 13.



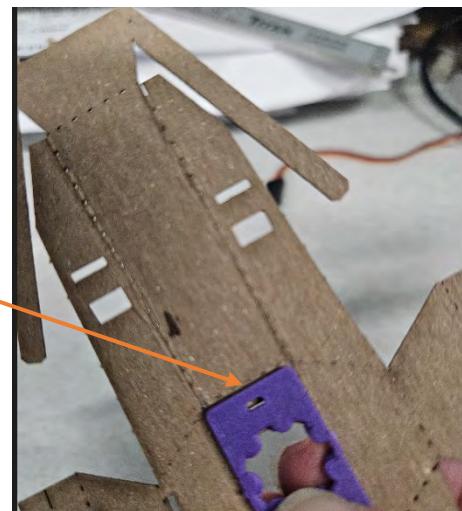
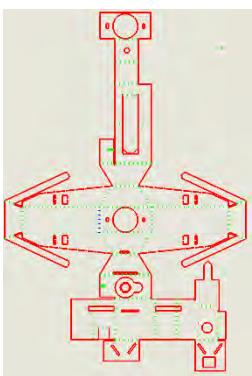
12) Flip and repeat



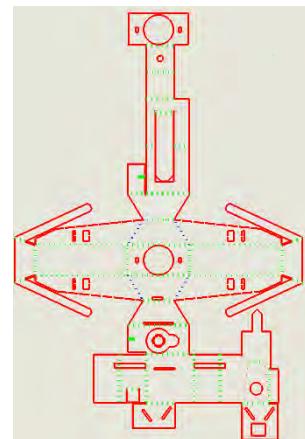
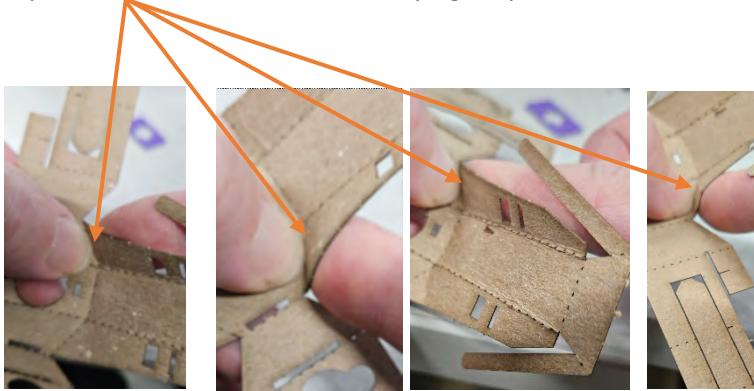
13) Using the lead nut as a guide, fold this dotted line up 45°. Make sure you are holding Component 13 in the correct orientation.



14) Repeat the 45° up fold on opposite side.



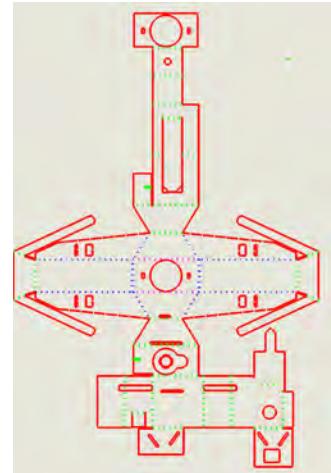
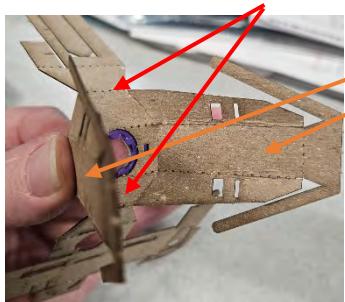
15) Fold up the four corner dotted lines, trying only to fold the corner.



16) Place the leadscrew nut under the large hole in the centre of the claw.

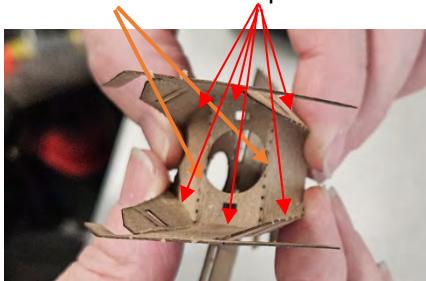


17) Then carefully pressing up, form the back of the large flaps of the claw, while also pushing down on the side tabs.

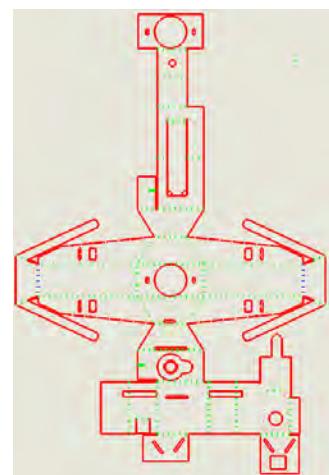
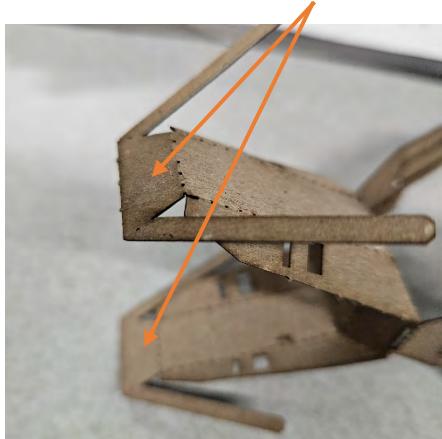


18) Continue to shape the claw, making sure that everything folds in the correct direction.

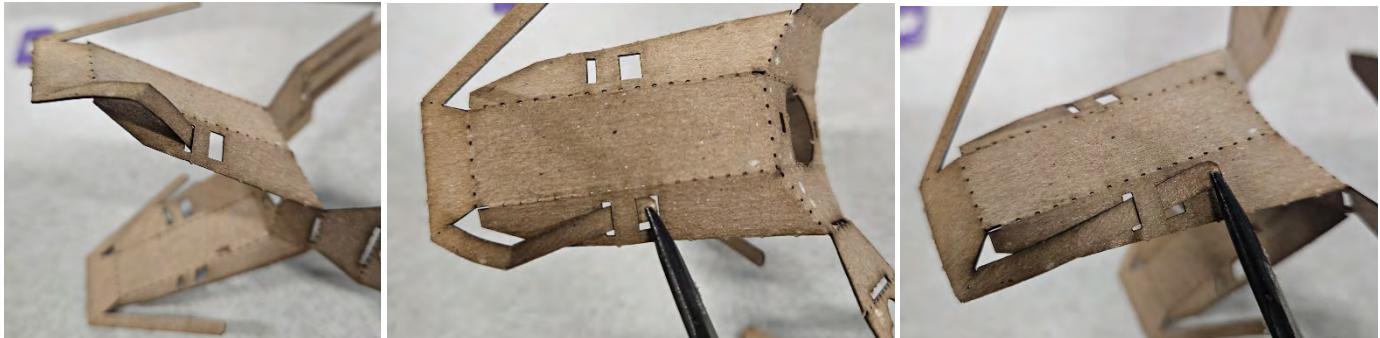
Down here and up here



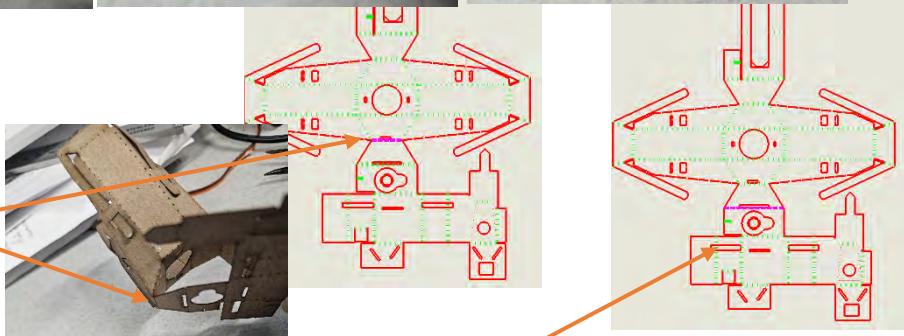
19) Bend inwards both front tabs of the claw.



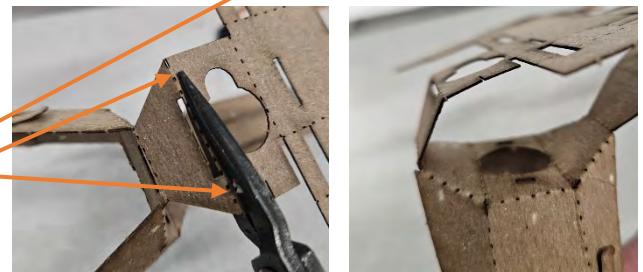
- 20) Feed one of the long thin tabs on front of claw through the thin slot on side of claw. Use a pair of needle nose pliers to pull the long tab through the wide slot.
- 21) Repeat for the other three long tabs.



- 22) Bend this side tab 90° under the claw.



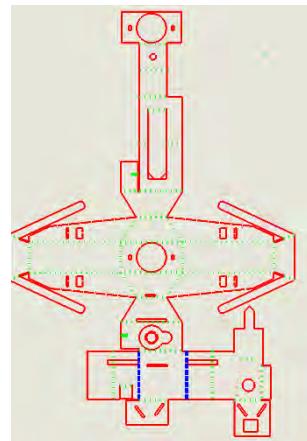
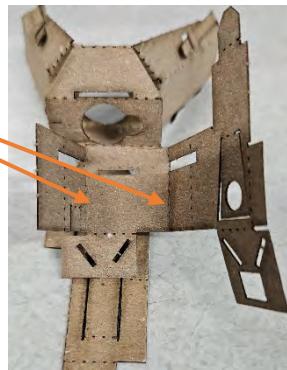
- 23) Using needle nose pliers to help the bending process, bend the next dotted line 90° under the claw.



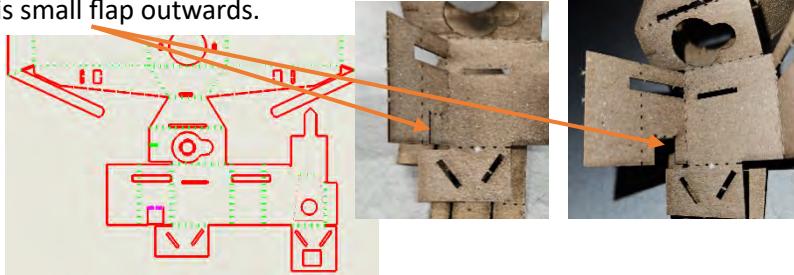
- 24) Use needle nose pliers to assist in bending this fold away from the claw.



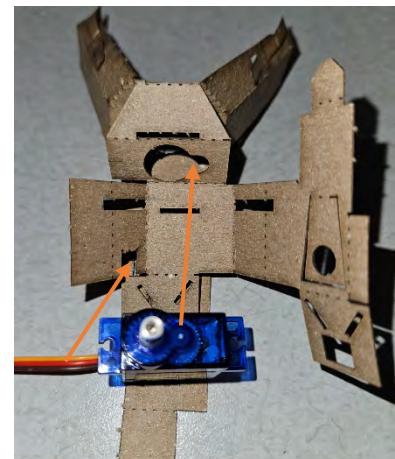
25) Fold these two dotted lines inwards. Fold one at a time.



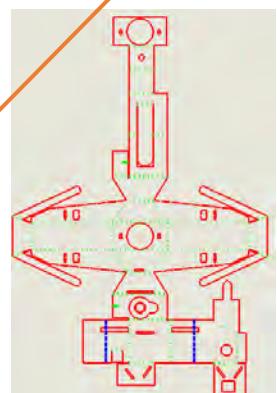
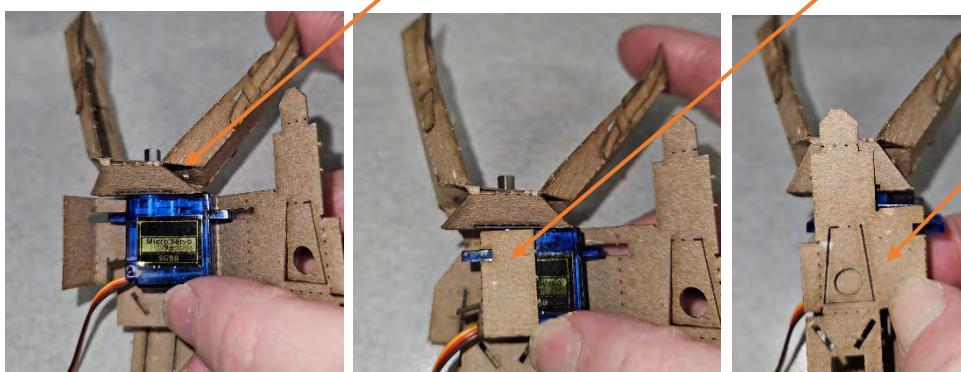
26) Fold this small flap outwards.



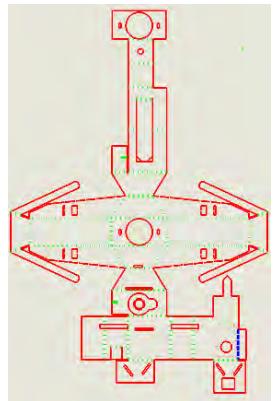
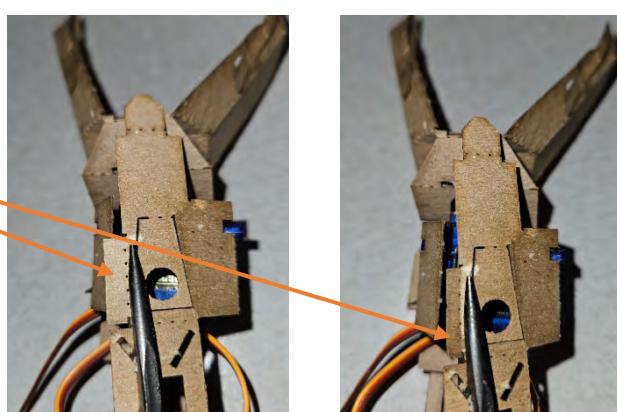
27) The next steps will require the servo with the hex standoff installed. The servo will be installed in this orientation. The servo wires will fit into the small flap hole and the servo top lobe will fit into the corresponding hole.



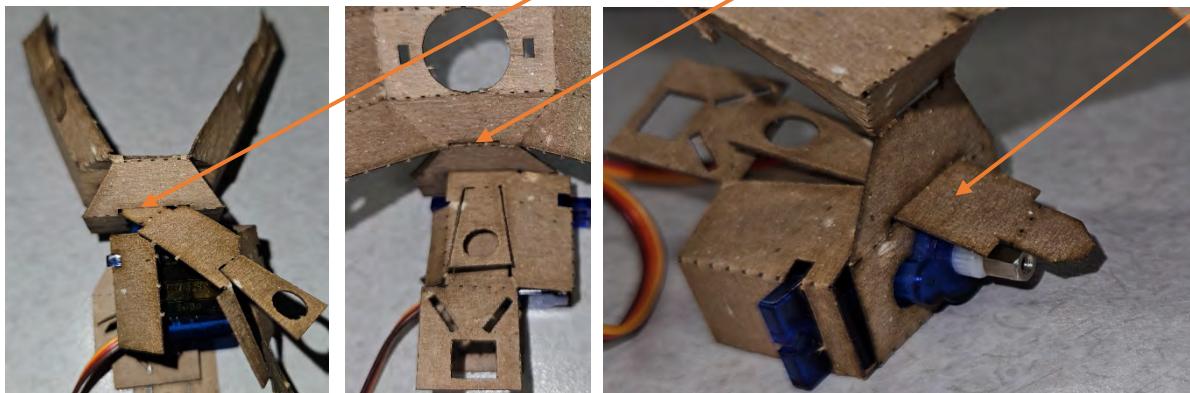
28) Place the servo into the larger hole/small hole pair. Then fold over the left flap, proceeded by the right flap.



29) Utilizing pliers, fold small side flap down 90°.

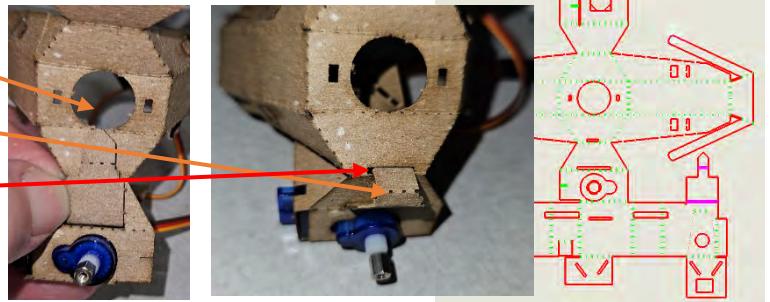


30) Unfold the right servo flap and slide the upper tab into the thin slot on the claw base. Feed the tab in completely.

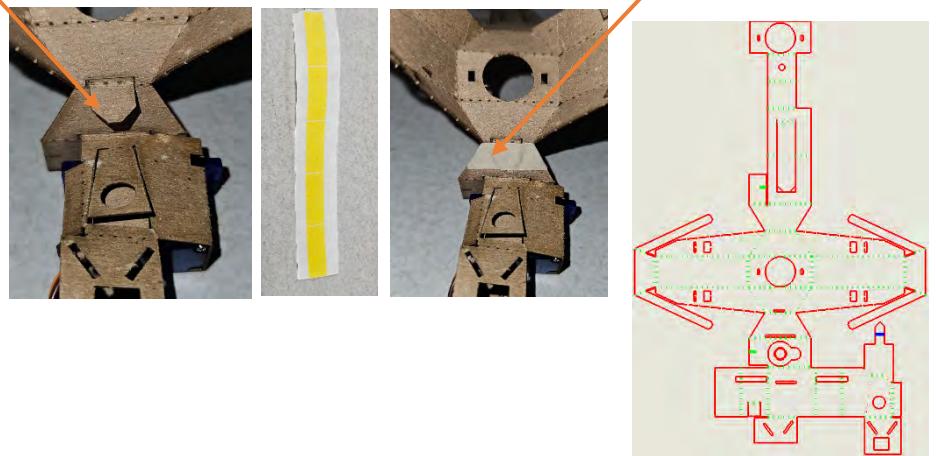


31) Fold this tab towards the bottom of the claw.

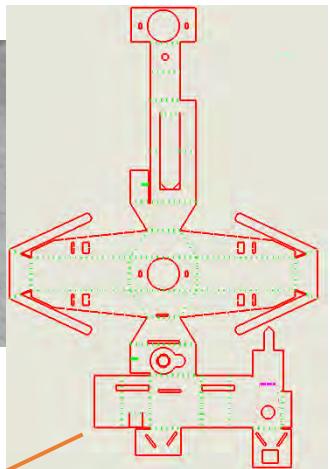
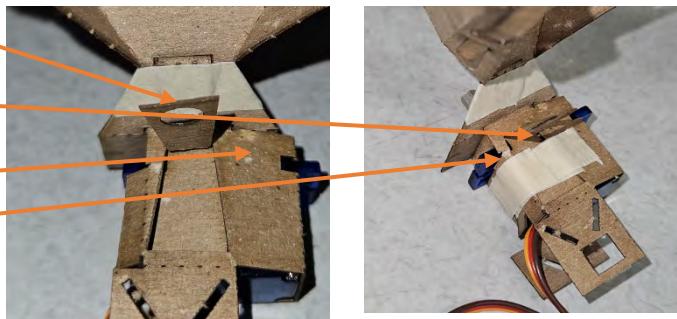
Slightly fold the upper part of this tab (along the dotted line) and tuck into the small slot in bottom of claw palm.



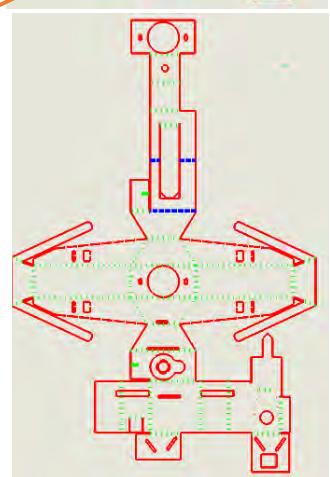
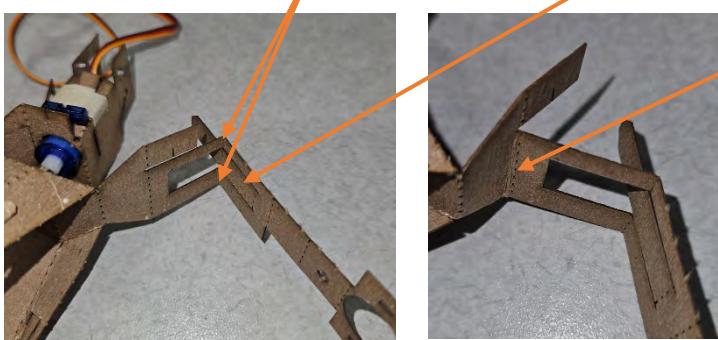
32) Turn over the claw and fold this tab over. Using one piece of the masking tape in your kit, tape down this tab.



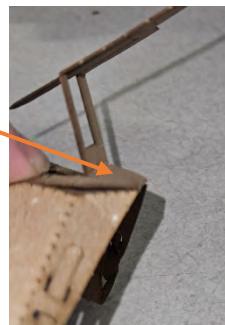
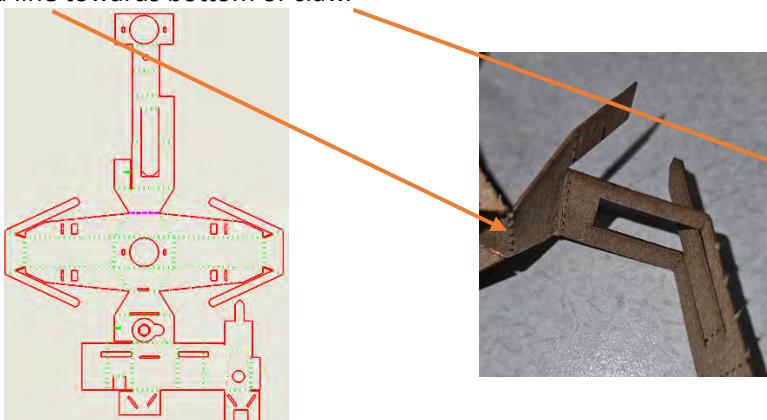
33) Fit the trapezoid tab up and place a piece of tape across the right servo flap and part way around the left side of the servo.



34) Fold towards the claw along these dotted lines (don't fold the thin inner tab). Fold this dotted line towards the claw.



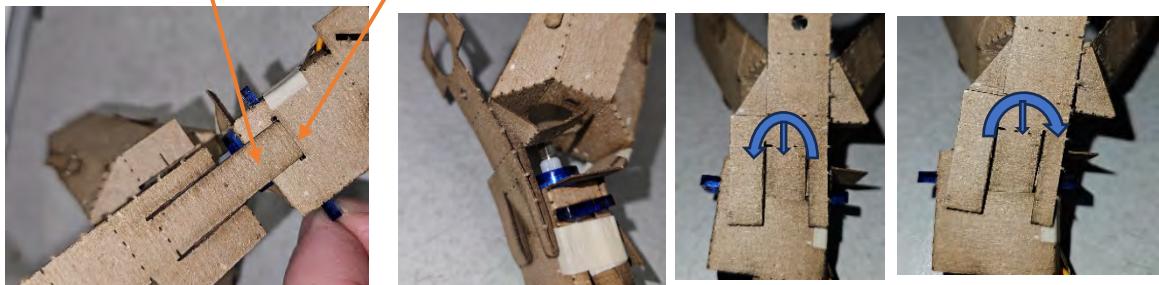
35) Fold this dotted line towards bottom of claw.



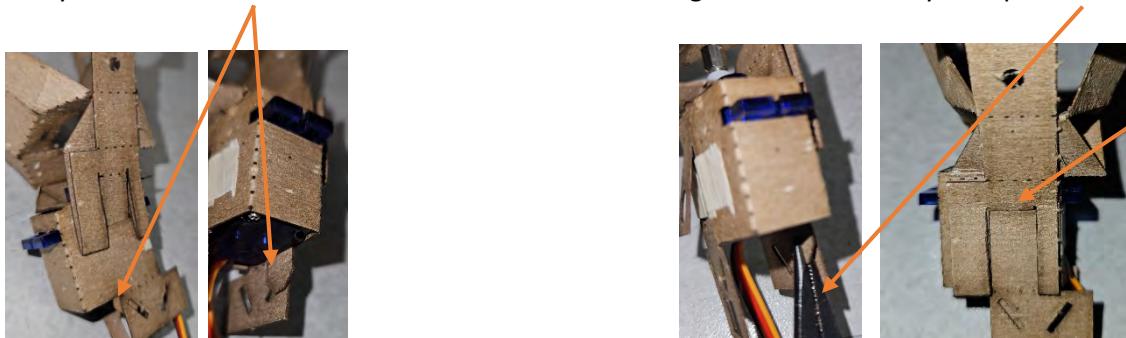
36) Using a small flat screw driver or similar, carefully bend open this thin slot (making it easier to insert long thin tab).



37) Slide the long thin tab into the thin slot. Wiggle and carefully push tab into slot.

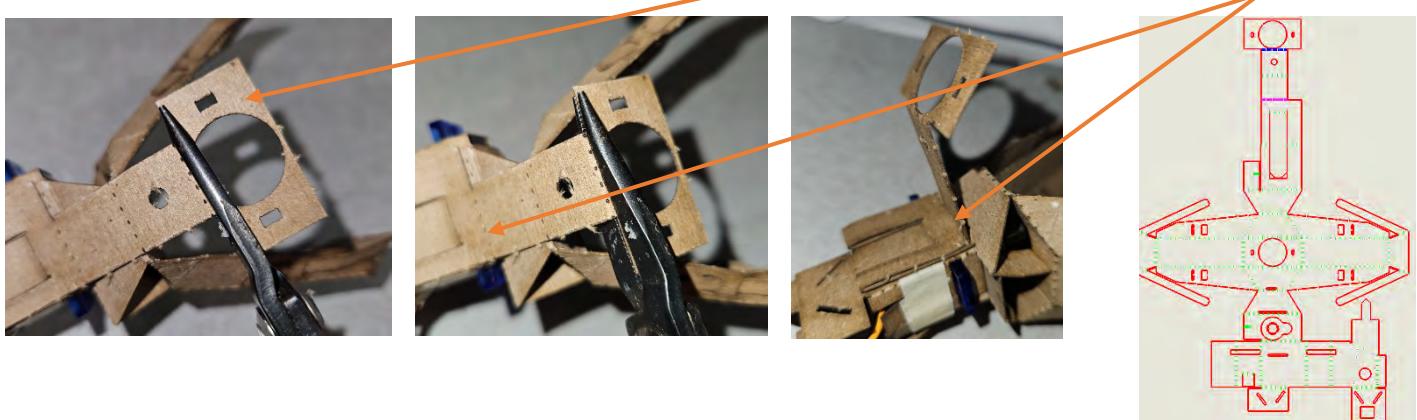


38) Until you can see it at the bottom of the servo. Pull the long thin tab all the way with pliers until it is seated fully.

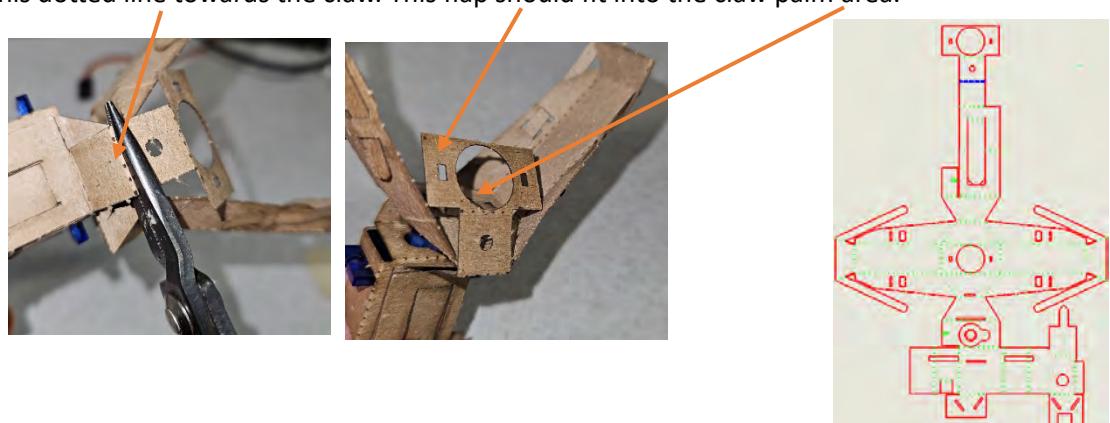


39) Plug in hot glue gun to let it come up to temperature.

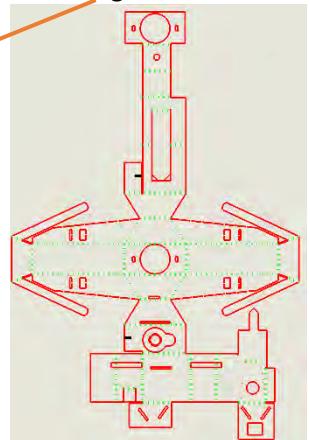
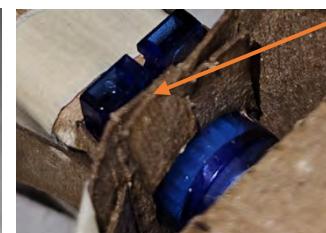
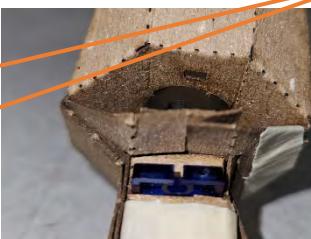
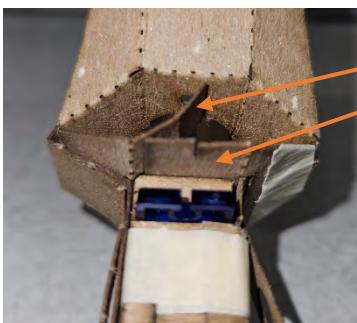
40) Utilizing pliers to make sure bend is straight, bend this flap **towards** the claw. Fold back along this dotted line.



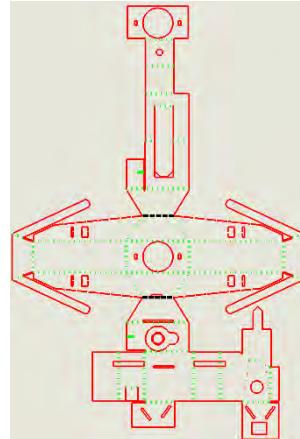
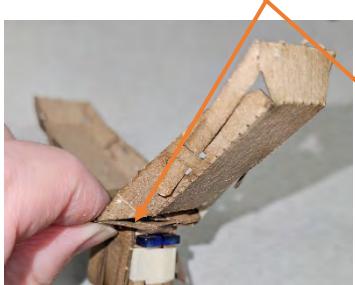
41) Using pliers, Fold along this dotted line towards the claw. This flap should fit into the claw palm area.



42) On the bottom of one side of the claw you will find two tabs with half cuts. Carefully fit these cuts together.



43) Squeeze tight, the claw side flap on both sides.



44) Find this part (you so carefully set aside 😊 in Step 8). Using side cutters, cut off small lobe.



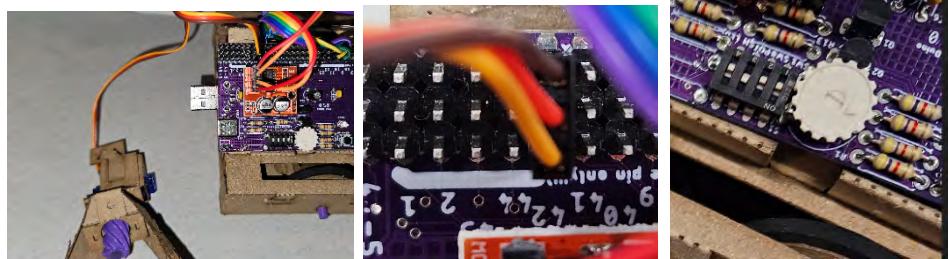
45) Set this part over the servo's axial.



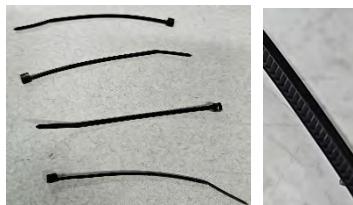
46) Use the glue gun to fill the bottom of the leadscrew with glue. Don't overfill, but also be sure that there is enough to securely attach to the hex standoff. Working quickly, before the glue can set, place the leadscrew over the hex standoff and push it down until it touches the card stock washer. Allow glue to cool and fully set before moving or turning leadscrew.



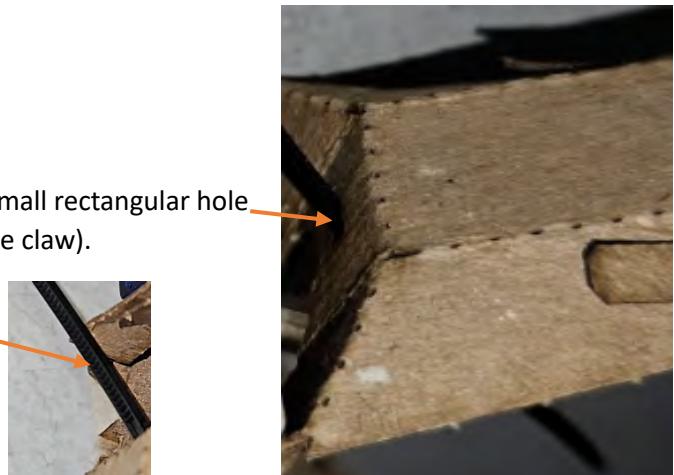
47) Plug the servo into the MSEduino three pin head number 42. Connect the MSEduino board to your computer and upload the Lab4 basecode. Press PB1 push button until Mode 3 shows up. Set the pot (R1) to approximately the centre of rotation. Unplug MSEduino board from your computer.



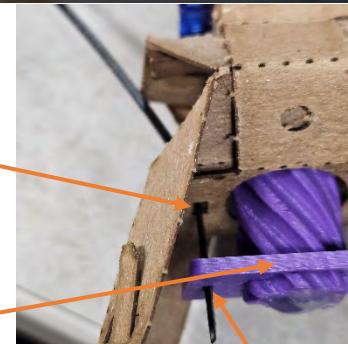
48) Pull out four of the small zip ties from your kit. Notice that the zip ties have one side with a row of small teeth.



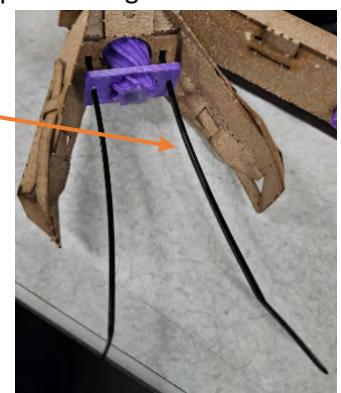
49) From the bottom of the claw feed the zip tie through the small rectangular hole (make sure the teeth are facing away from the center of the claw).



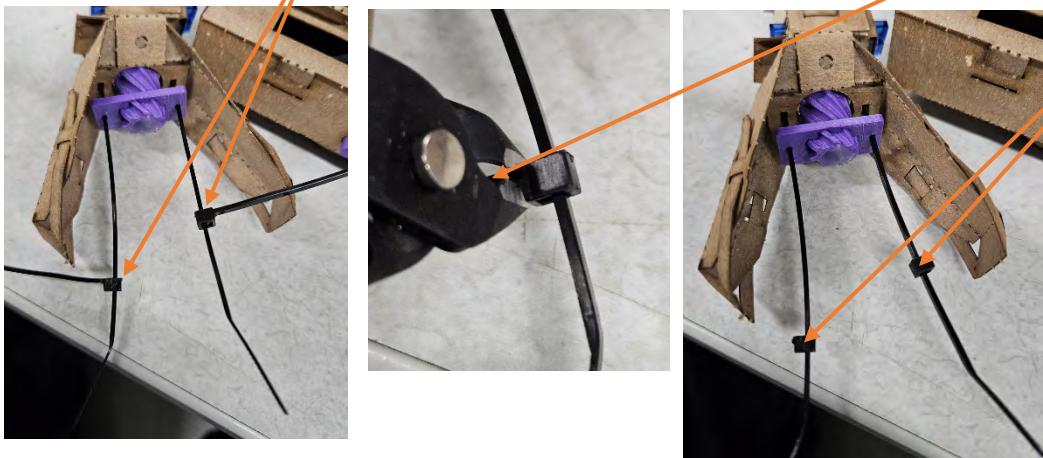
50) Through the other rectangular hole in the flap in the palm of the claw.



51) Put the lead screw nut on the lead screw about 1–2 mm from the top and feed the zip tie through the small rectangular hole in the lead screw nut. Repeat Steps 49 to 51 (once more) on the opposite side of the claw.

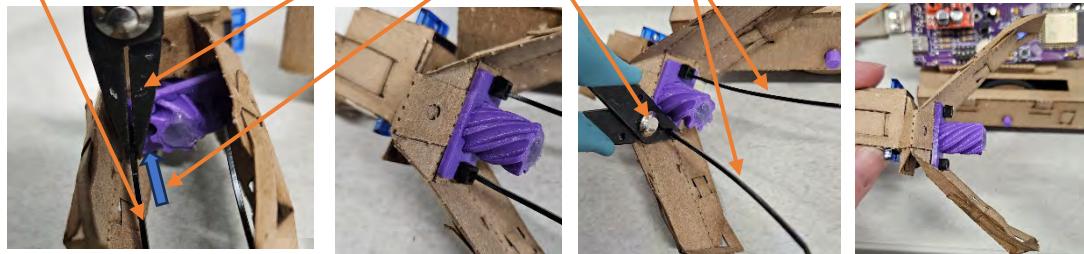


52) Take the other two zip ties and slide them on to the two zip ties on the claw. Cut off the zip leaving just the ties.

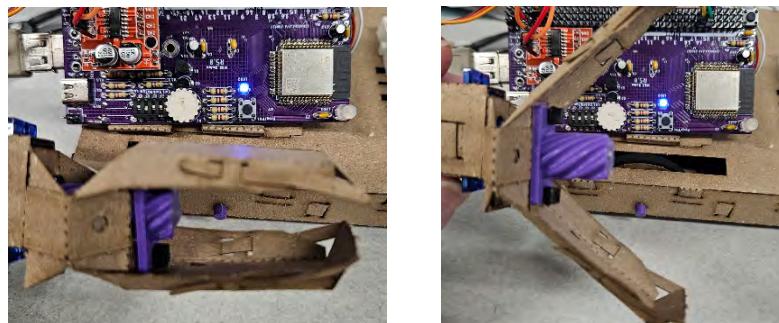


53) While holding on to the zip and using a pair of pliers to slide the tie down the zip until it can't slide any more. Repeat this for the other tie.

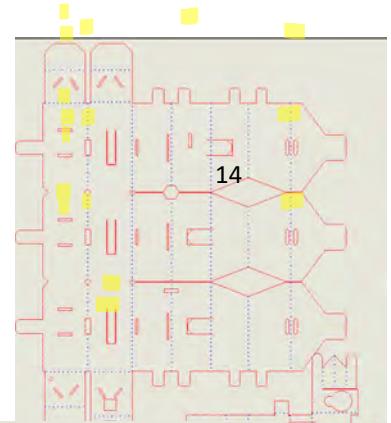
Cut off the zips of the zip ties in the claw.



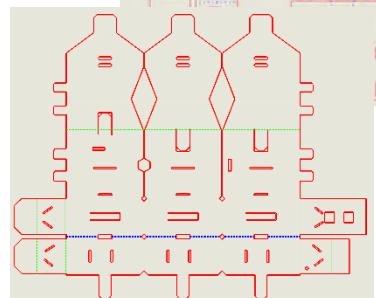
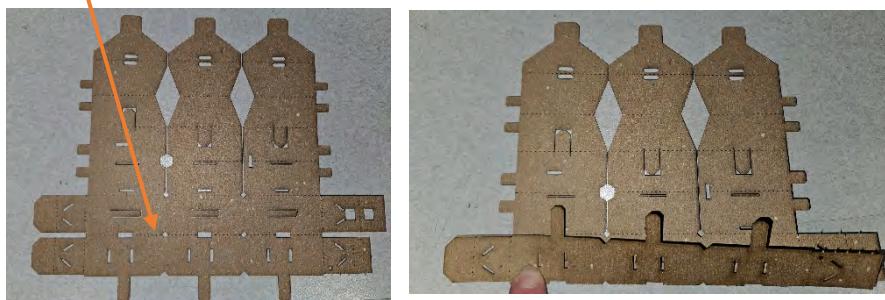
54) Power the MSEduino back up and press the PB1 button to put the MSEduino into Mode 3. Turn the pot to make sure your claw opens and closes. Unplug the MSEduino.



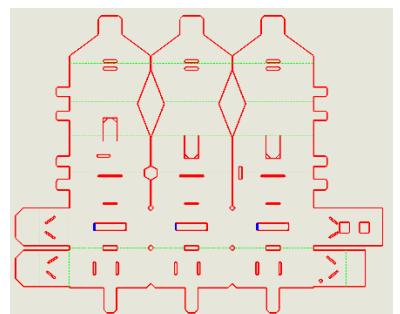
55) Remove Component 14 (the arm) from its sheet and remove the holes.



56) With Component 14 flat on the desk in this orientation, Fold the bottom up along this dotted line.



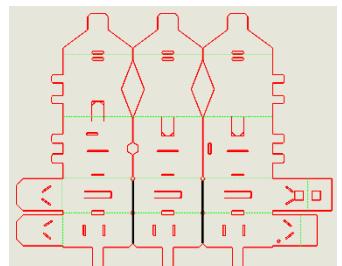
57) Fold the three inner tabs up then put through slots in the large folded tab.



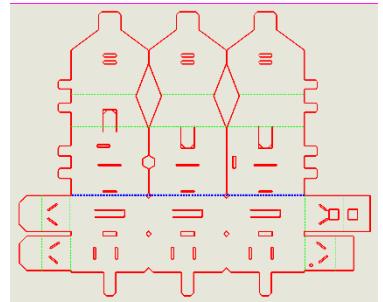
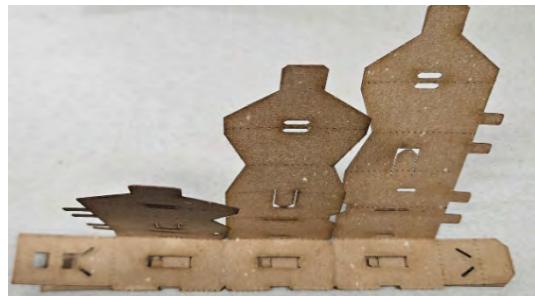
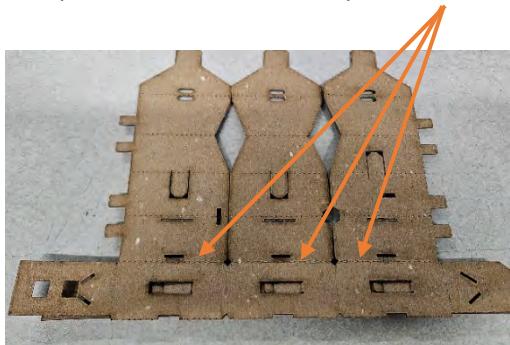
58) Tuck the three inner tabs from Step 57 into the other slots in the large folded flap. Make sure the inner tabs are pulled fully through.



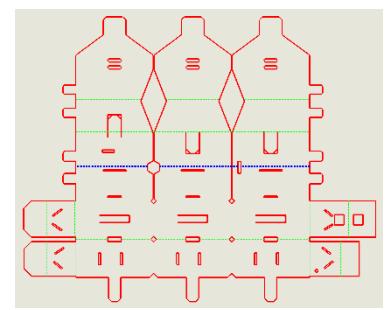
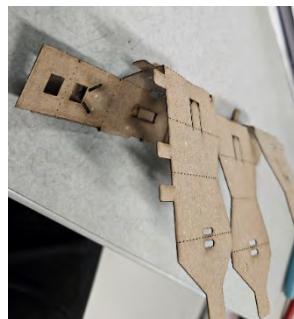
59) Fold both up and down along the middle of each upright.



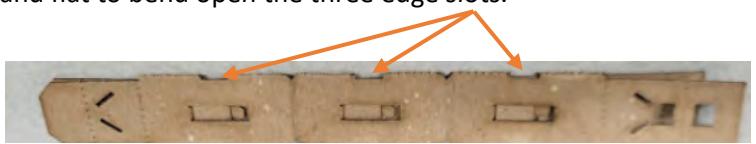
60) Flip over and fold, toward you, the three towers. Fold to approximately 120°.



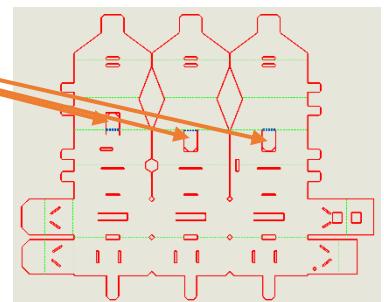
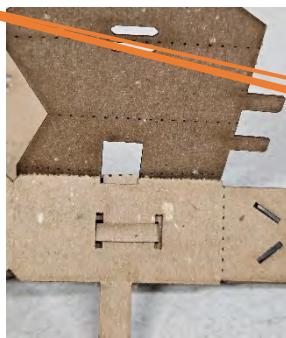
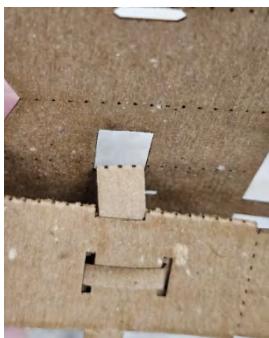
61) Fold the next dotted line, the ones that are up from the last dotted line, approximately 120° towards you.



62) Use a small flat screwdriver or something else small and flat to bend open the three edge slots.

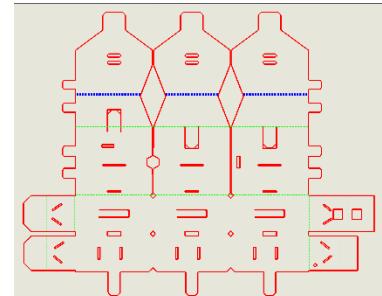


63) Fold, towards you, the three inner tabs, then tuck them into the edge slots you opened in Step 62.

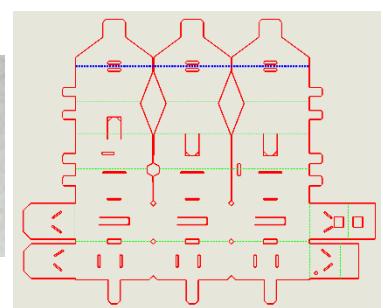
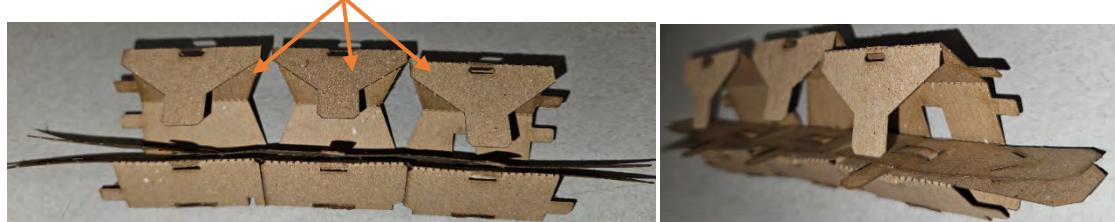




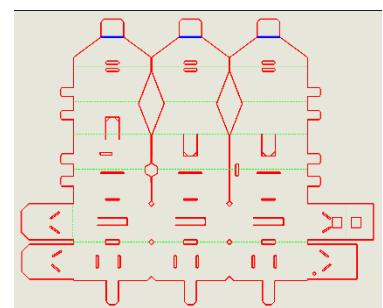
64) Fold these three sections towards you by approximately 90°.



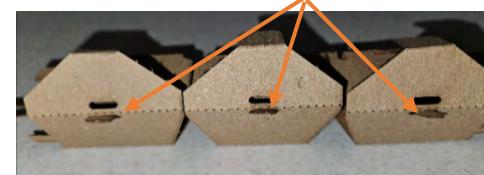
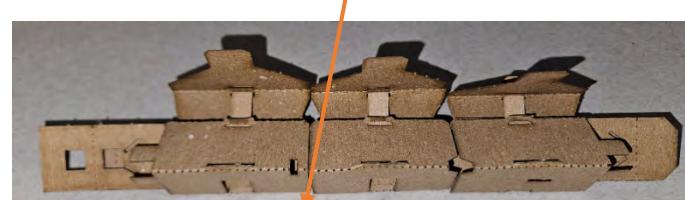
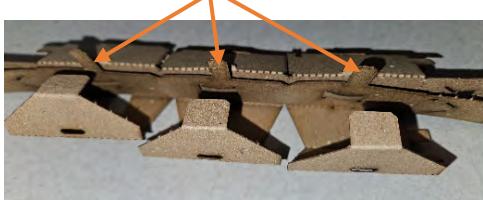
65) Fold these three sections towards you by approximately 90°.



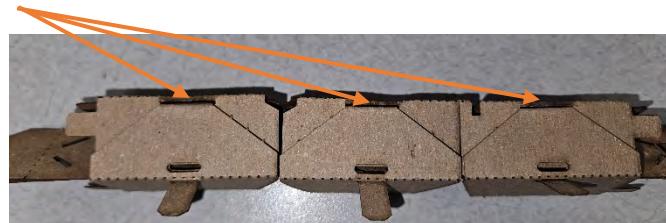
66) Fold the three top tabs, towards you, by approximately 90°.



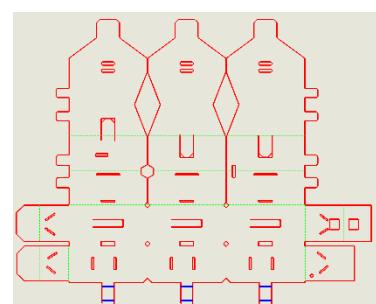
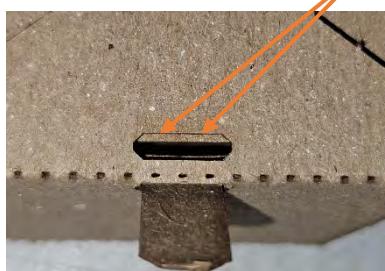
67) Feed the three end tabs (opposite end from Step 66) into the lower oval slot.



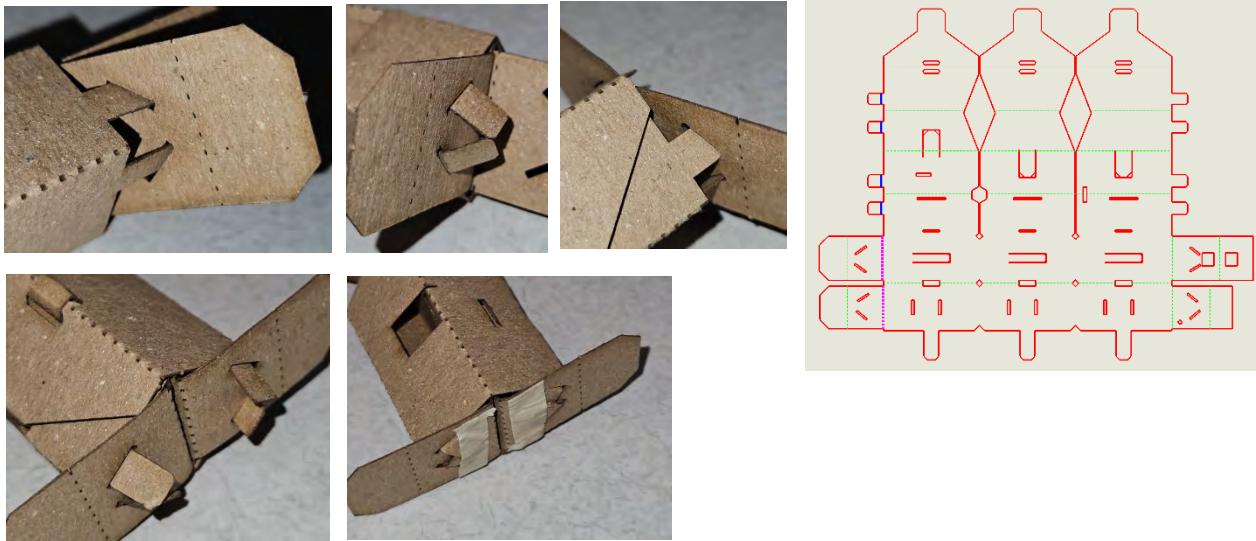
68) Feed the top three tabs into the large slots.



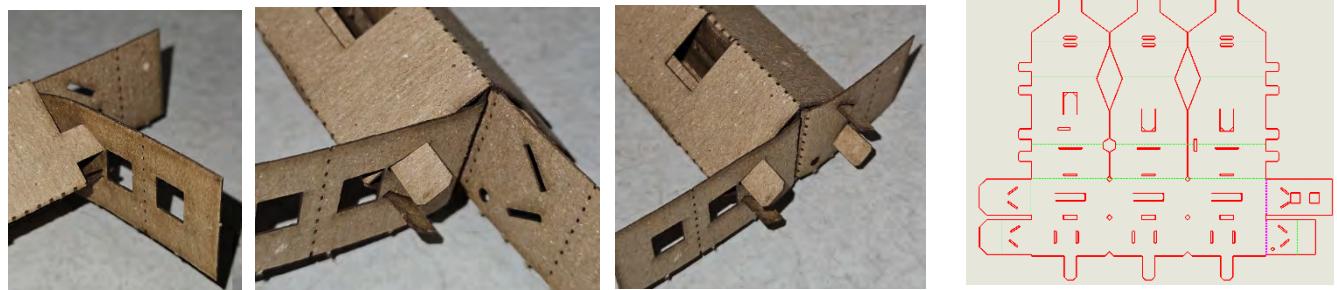
69) Bend the three tabs from Step 67 enough so that they can be fed into the other oval slot. Make sure you feed them through both layers of the holes. If the layer holes don't align, you many need to adjust the placement of the top tab from Step 68.



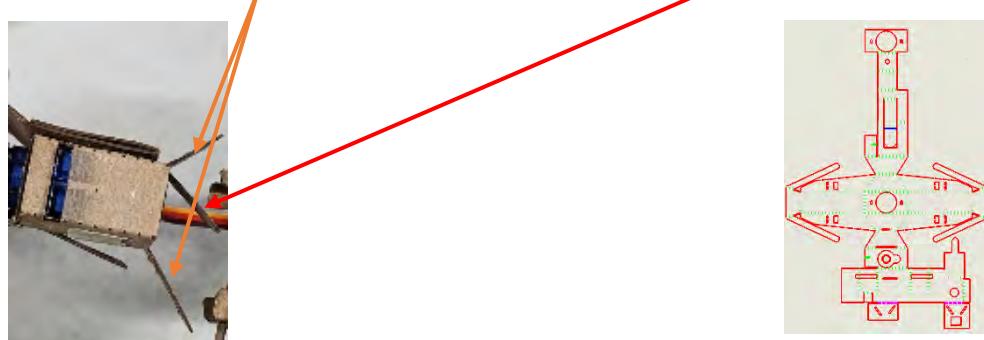
70) Fold the bottom tabs of the arm 90°. When folding, make sure that the small side tabs feed through the angled slots in the bottom tabs. Fold over the small tabs, towards each other. Tape these tabs down.



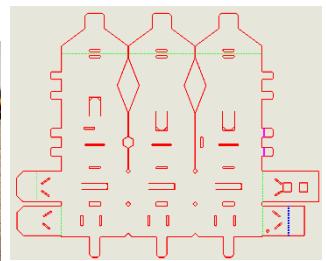
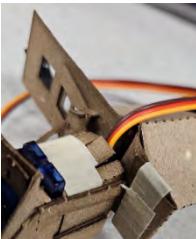
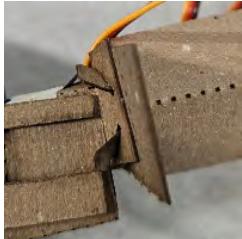
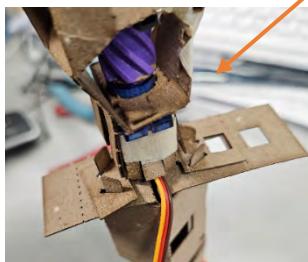
71) Fold the top tabs of the arm 90°. When folding, make sure the small side tabs feed through the angled slots in the top tabs. **Do not fold the small tabs at this time.**



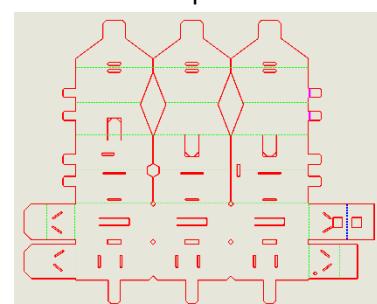
72) On the claw, bend the bottom two larger tabs away from the servo, by 90°. Fold the inner thinner tab towards the servo.



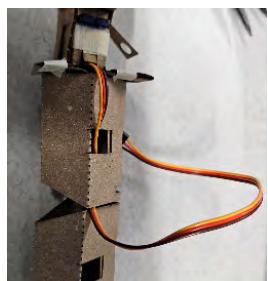
73) Place the claw onto the top of arm (top of arm has square holes in one of the large flaps) with the square hole flap of the claw in line with the square hole flap of the arm. Feed the small tabs of the arm through the angled slots of the claw flaps. Starting on the flaps with no square hole, fold the small tabs outwards, then fold the arm flap, at the middle-dotted line, over the small tabs and claw flap. Tape this fold closed.



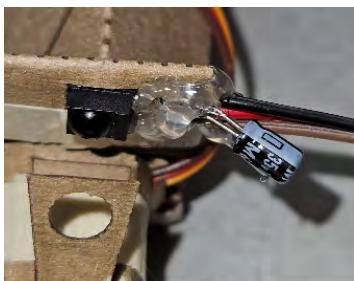
74) Fold the small tabs outwards on the square hole side flap. Fold the middle-dotted line over the small tabs and claw flap. Make sure square holes line up. Tape closed the flap but do not block square hole with tape.



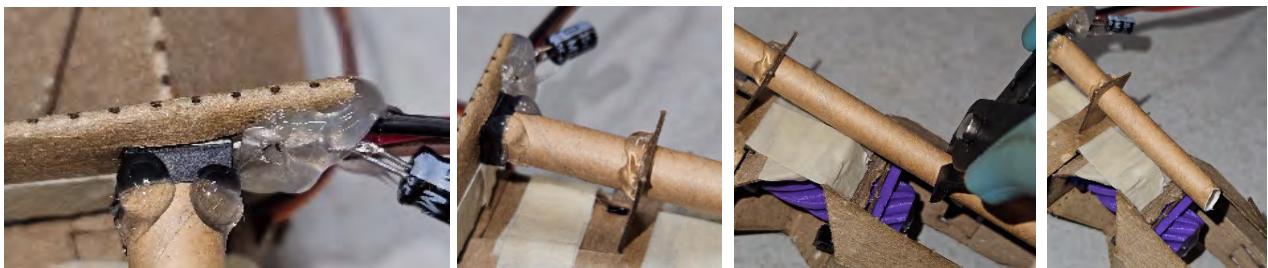
75) Feed the claw servo wire through the upper square hole in the side of arm then feed it out again at first bend joint from the top of the arm. Feed it back into the arm through square hole in the middle of the middle joint and back out of the lower bend joint slot.



76) Using a hot glue gun, glue the IR receiver on to the arm/claw into the square hole on the top of the arm tab. Make sure that the IR receiver dome is facing up towards the claw.



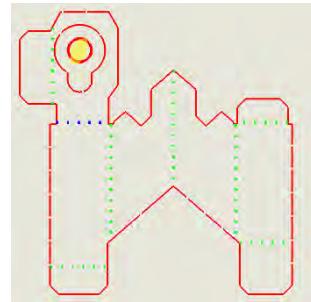
77) Once glue has cooled, slide the paper straw through the trapezoid tab's hole and over the IR receiver dome. While pushing the straw tight to the IR receiver, apply glue to both the straw and IR receiver. Don't let go until the glue has cooled. Apply glue to the trapezoid tab and the straw.



78) Following the same path as in Step 75, feed the IR receiver wires down the arm. Set the arm/claw aside.



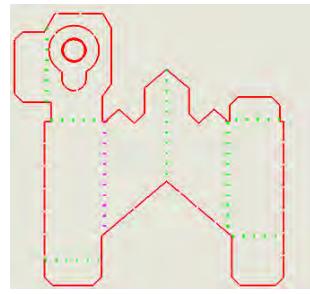
79) Pull Component 15 from its sheet and remove the **hole**.



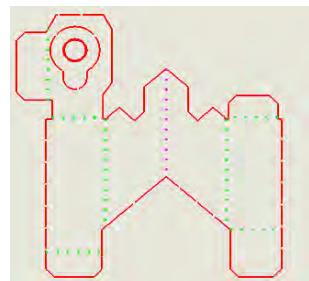
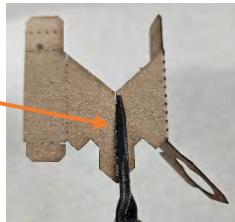
80) Bend up (dogs head), approximately 45°.



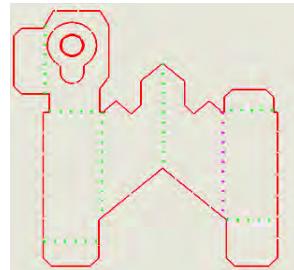
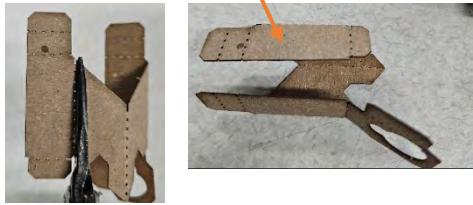
81) Flip over Component 15 and bend 60°.



82) Bend middle dotted line approximately 60°.
Use pliers to give straight bend.



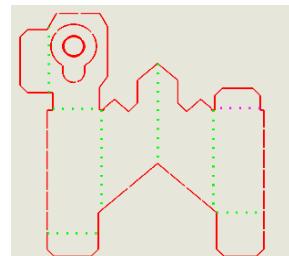
83) Bend (back leg) 60°.



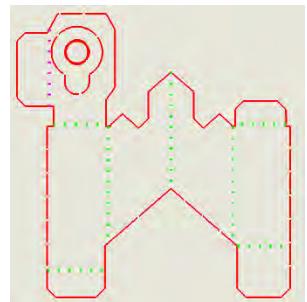
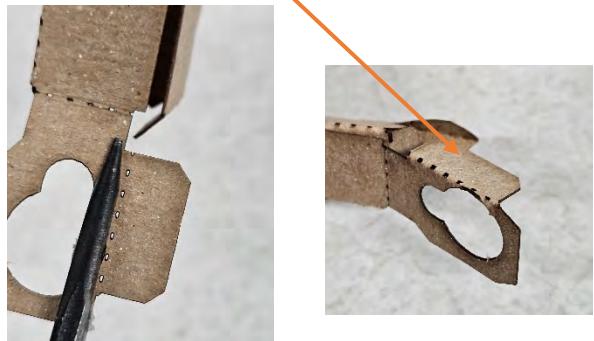
84) These three bends should allow Component 15 to fold into a triangle with the “back leg” fitting inside the triangle.



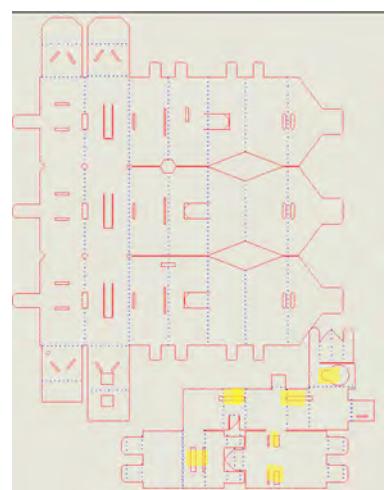
85) Bend the small back tab (the tail) towards the inside of the triangle.



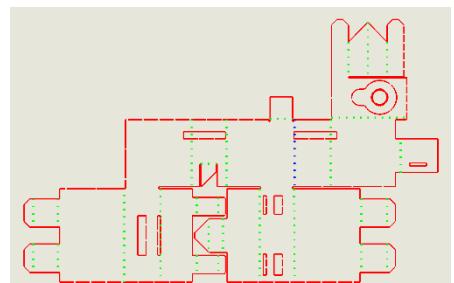
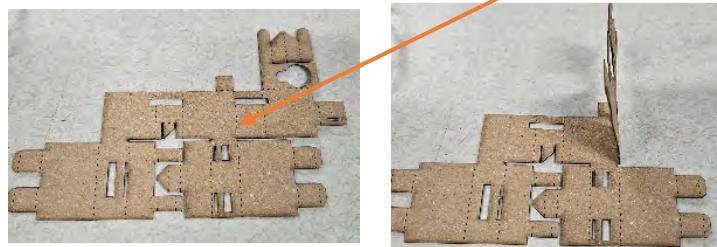
86) Using a pair of pliers, bend the “nose” tab back toward the triangle by 90°.



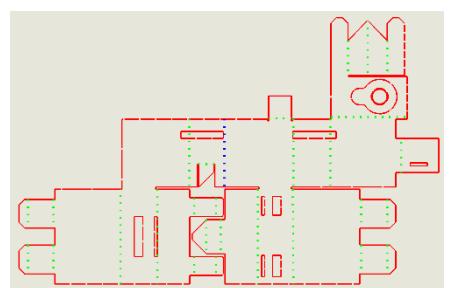
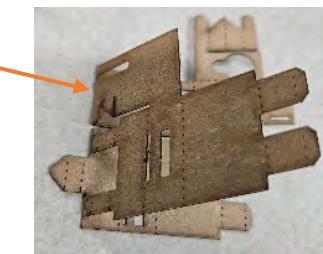
87) Remove Component 16 from its sheet and remove the holes.



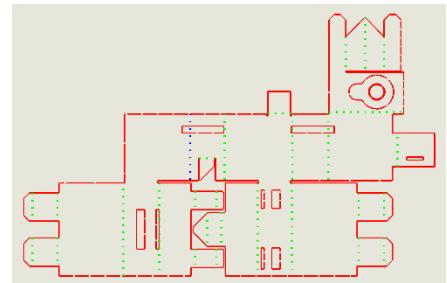
88) With Component 16 on the table in this orientation, bend up along this dotted line by 90°.



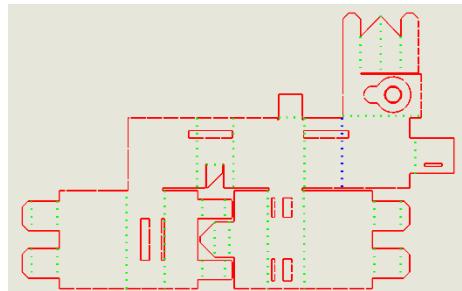
89) Bend up, along this dotted line.



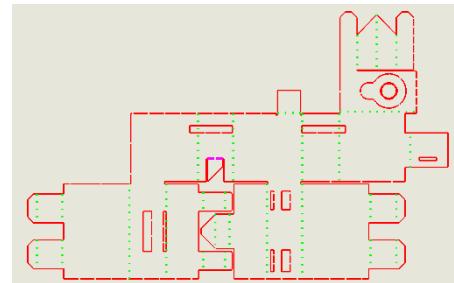
90) Bend inwards, on this dotted line.



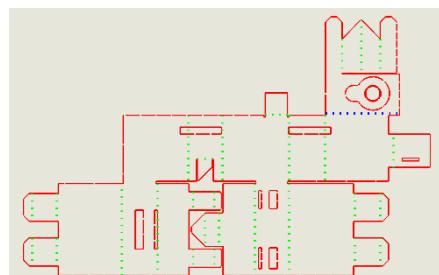
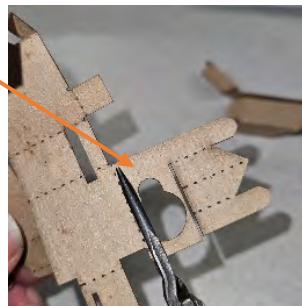
91) Bend inwards, on this dotted line.



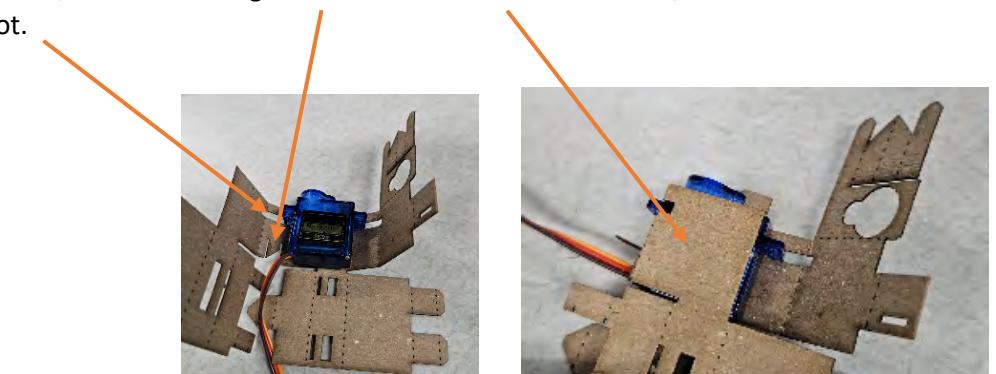
92) Fold out this small tab.



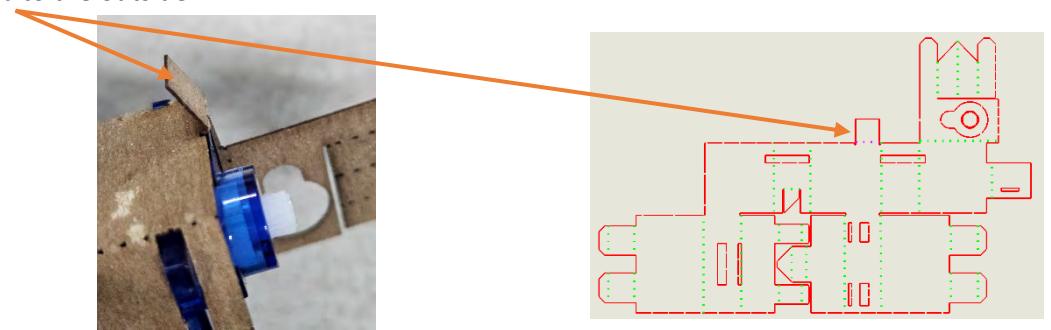
93) Using pliers, bend this tab upwards 90°.



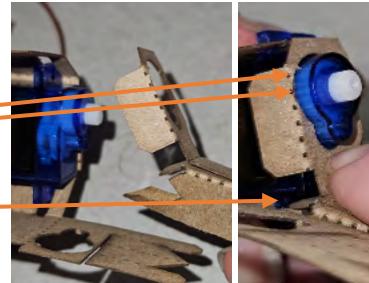
94) Place the last servo on Component 16, with cord facing small tab. Fold left side over servo, make sure wire fits in small tab slot and servo tab is in this slot.



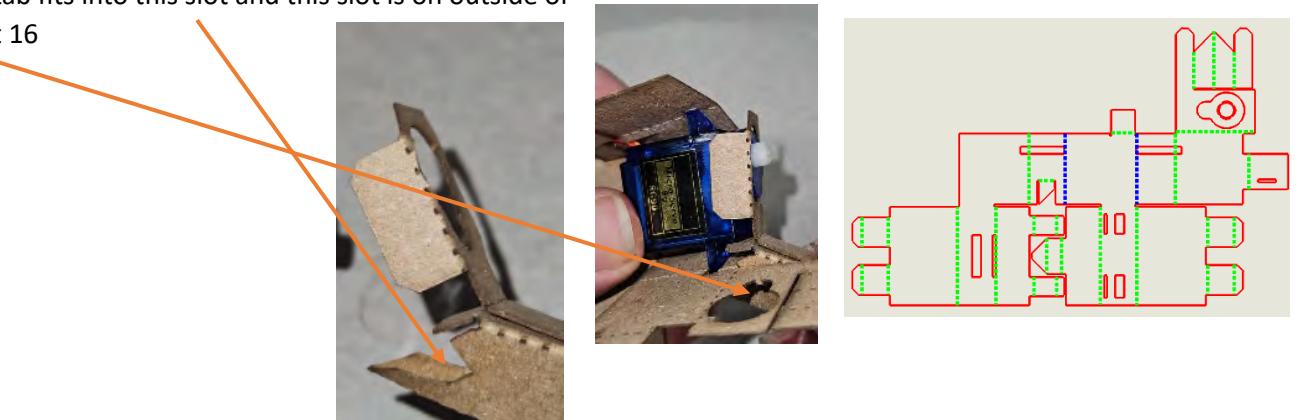
95) Fold down the small square tab to the outside.



96) Lift tab up from Step 95, then take Component 15, make sure it is folded into a triangle, put it over the servo double circle with Component 15 "nose" sitting on left side of servo. The small tab on Component 15 fits under the servo between the servo and Component 16.



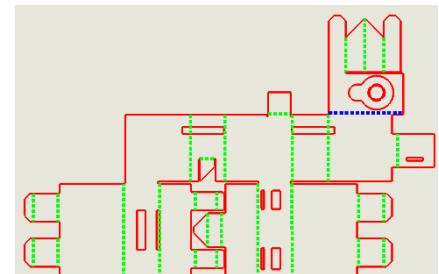
97) The servo tab fits into this slot and this slot is on outside of Component 16



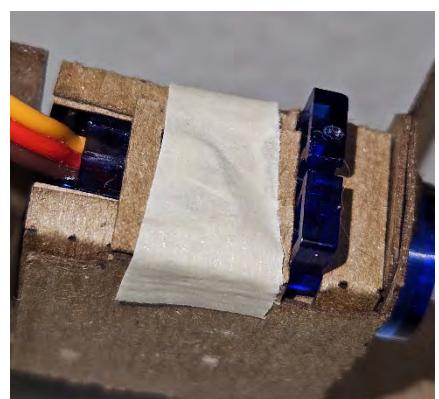
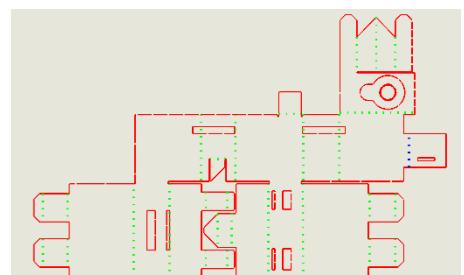
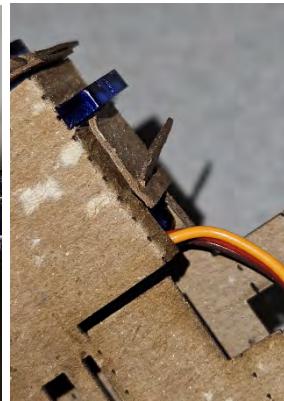
Refold top flap down, then bottom flap up.



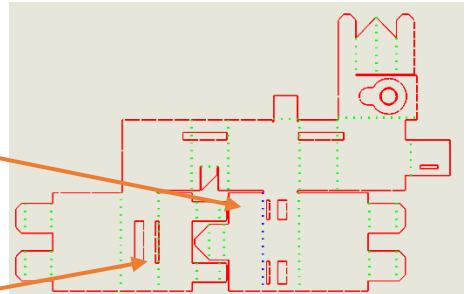
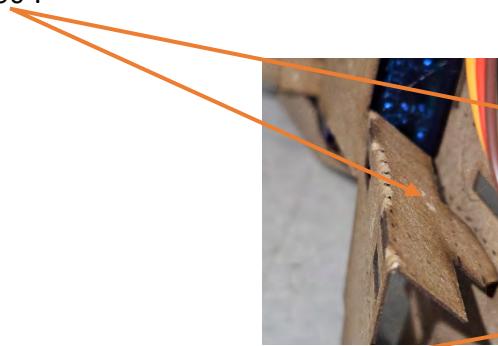
98) Fold double circle flap over servo's double circle.



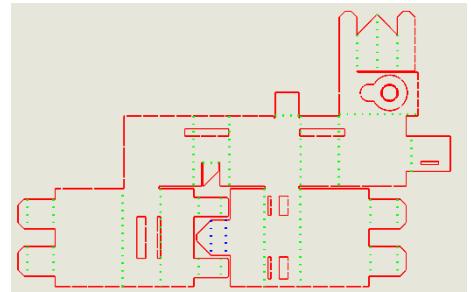
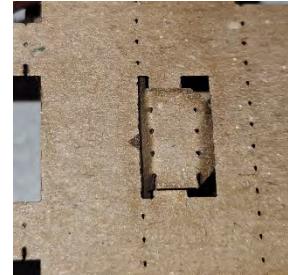
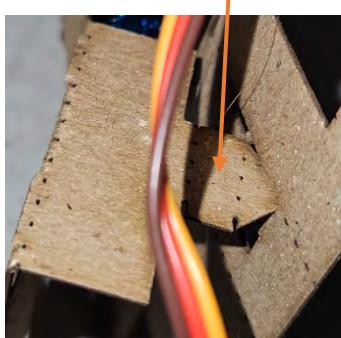
99) Fold the slotted tab over servo while feeding wire opening tab into slot. Use pliers to pull through then bend over wire tab. Tape down.



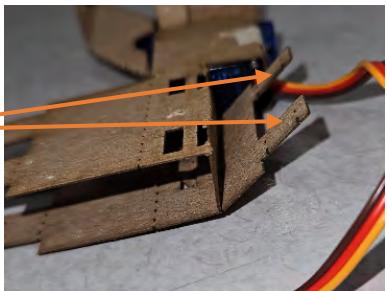
100) Fold this tab 90°.



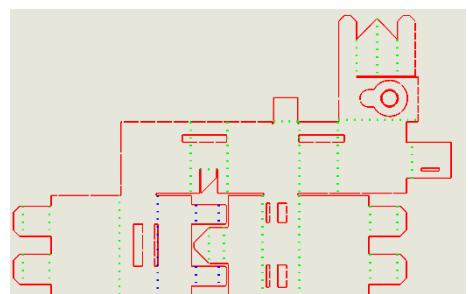
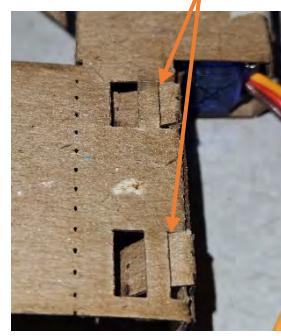
101) Feed its tab into thin slot on other side. From behind other side, bend tip to feed into large slot.



102) Slightly bend the two sets of dotted lines on the two thin tabs.



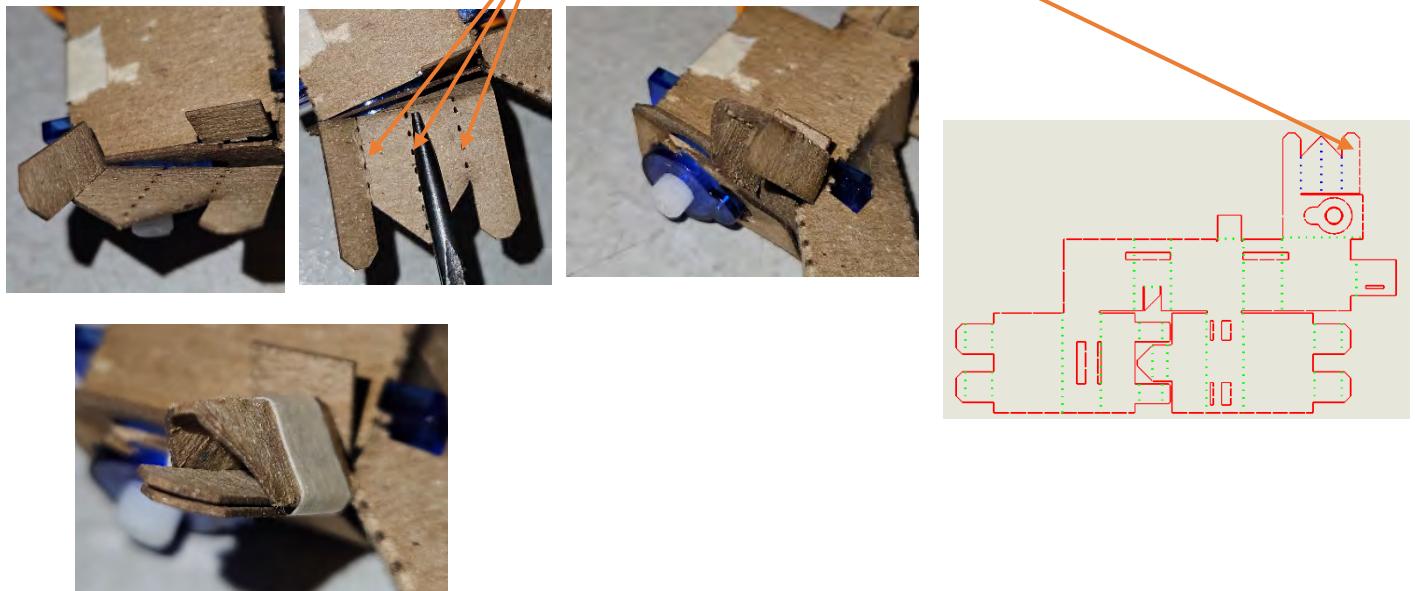
103) Fold over the large flap and feed the two thin tabs into the top thin slots.



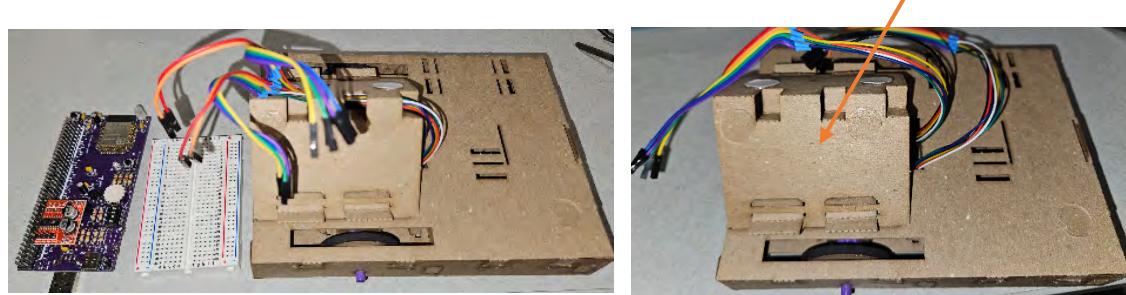
104) Using pliers, feed the two thin tabs back through the larger slots.



105) Consecutively fold these three dotted lines approximately 60° . The outer flap should end up on the inside of the triangle formed. Tape the triangle.



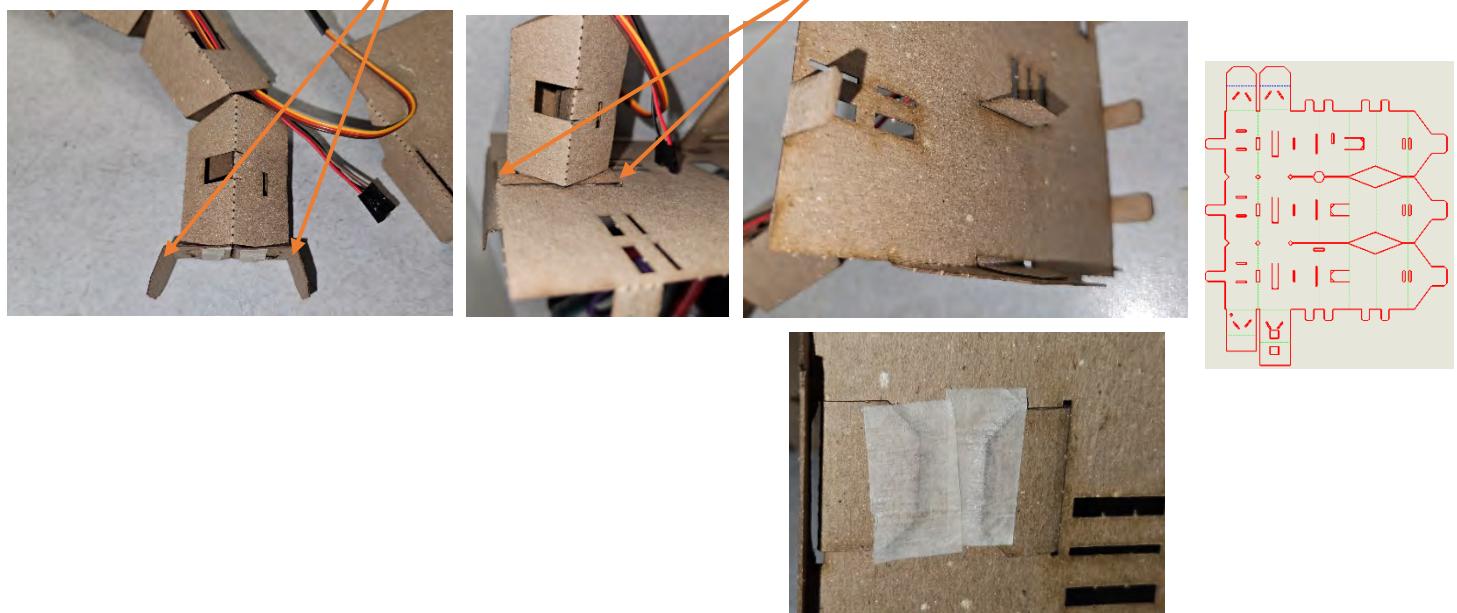
106) Remove the breadboard, MSEduino and feed the wires back out of the board holder.



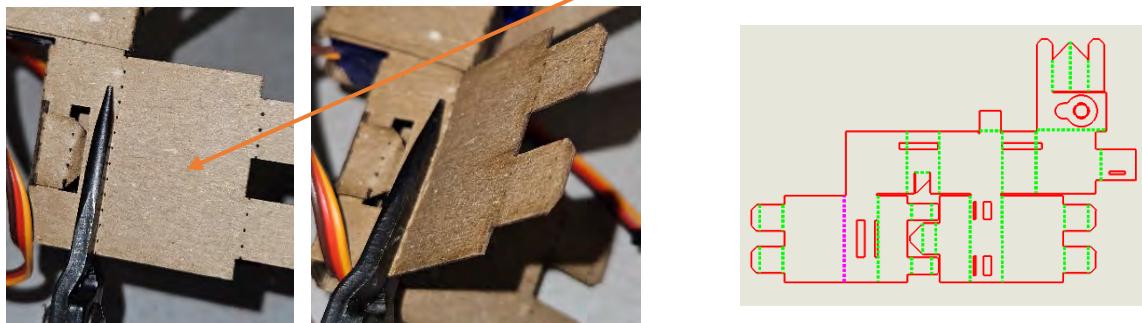
107) Carefully take the top of the MSEbot off.



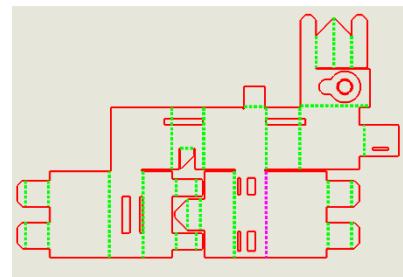
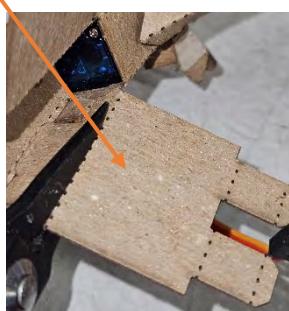
108) Bend the bottom two flaps on the arm. Slide them into the slots on the top front of the bot. Fold them over and tape them down.



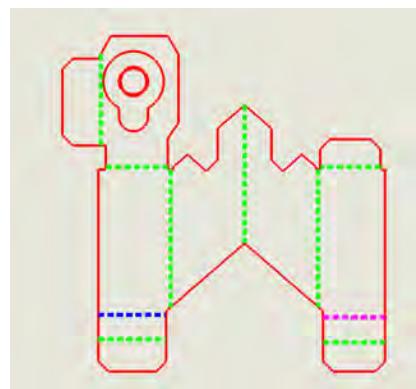
109) Set the top aside and pick up grouped Components 15 & 16. Bend the large flap approximately 30° outwards.



110) Turn it over and bend out the other large flap, 30°.



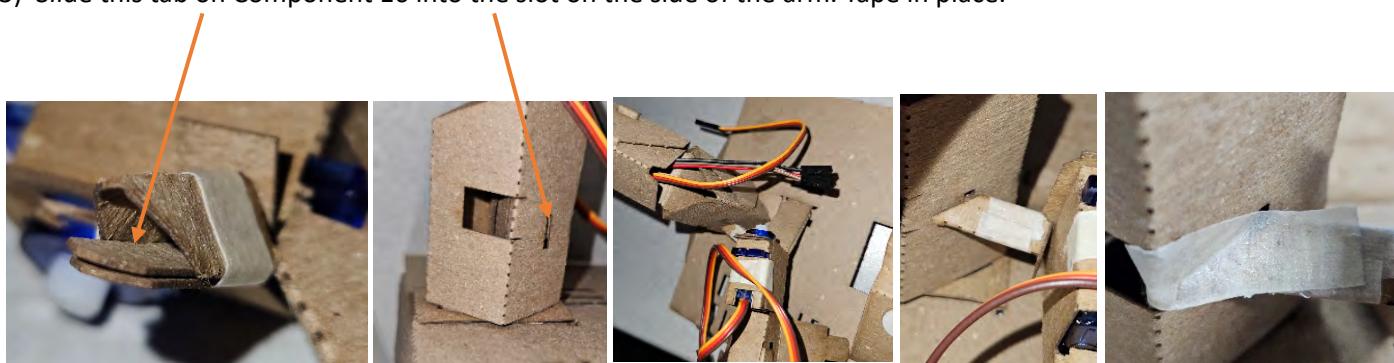
111) Bend the two tabs on the bottom of Component 15. Bend the outer one out and the inner one in. Squeeze them together again and slide them through the center slot just behind the arm.



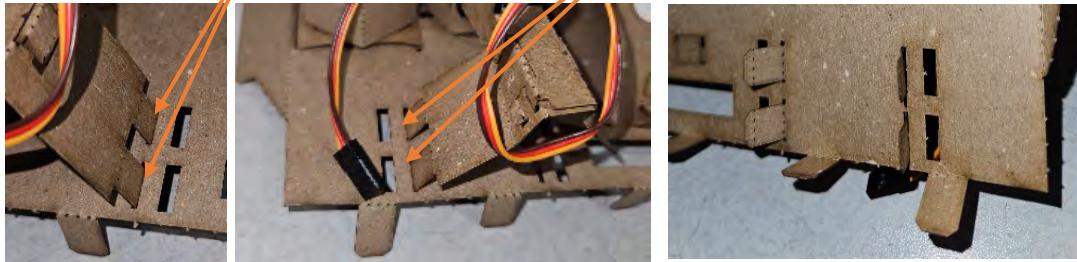
112) Using pliers, fold the tip of the tab from Step 111 into the larger slots. Pull taut. Repeat for the other tab.



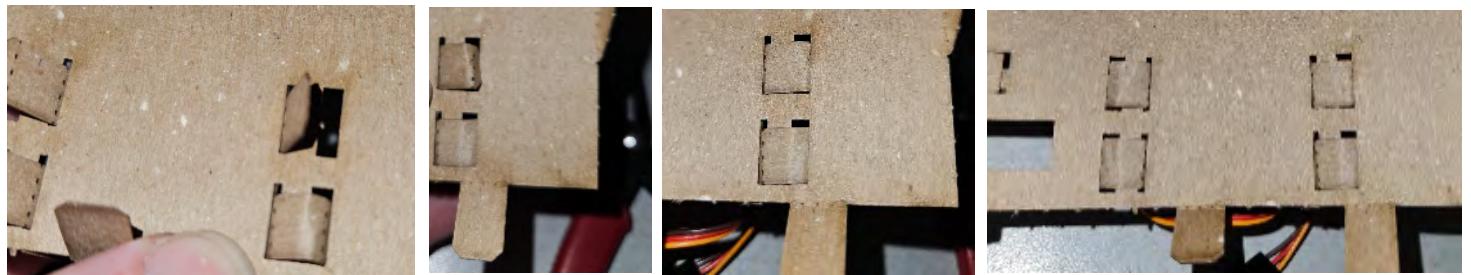
113) Slide this tab on Component 16 into the slot on the side of the arm. Tape in place.



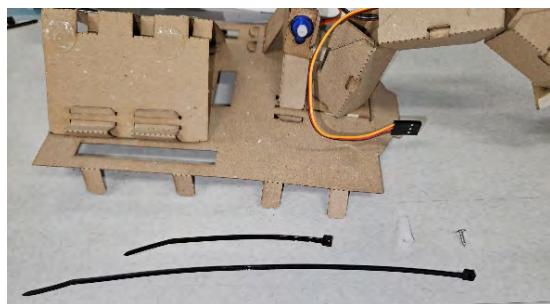
- 114) Slide the two smaller tabs on bottom of Component 16 into thin slots on top, left side. Then slide the two tabs on other side of Component 16 into thin slot on top.



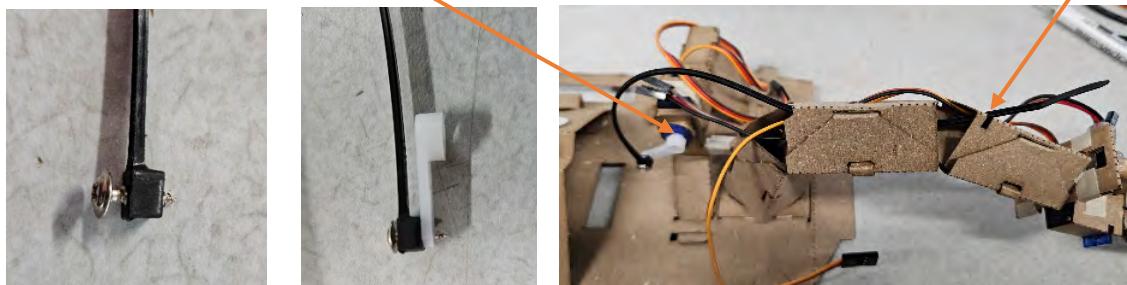
- 115) Fold the tips of Component 16 , four small tabs on the underside of the top, into their respective larger slots. Use pliers to snug to thin slot.



- 116) From the kit, find a 4" and 8" zip tie, a one-sided servo horn and a large head servo screw. Which holding the servo securely, put on horn and turn counterclockwise until servo just stops. Remove the horn and replace so horn is facing down and to the right slightly. Turn the servo horn clockwise to about 8 o'clock.



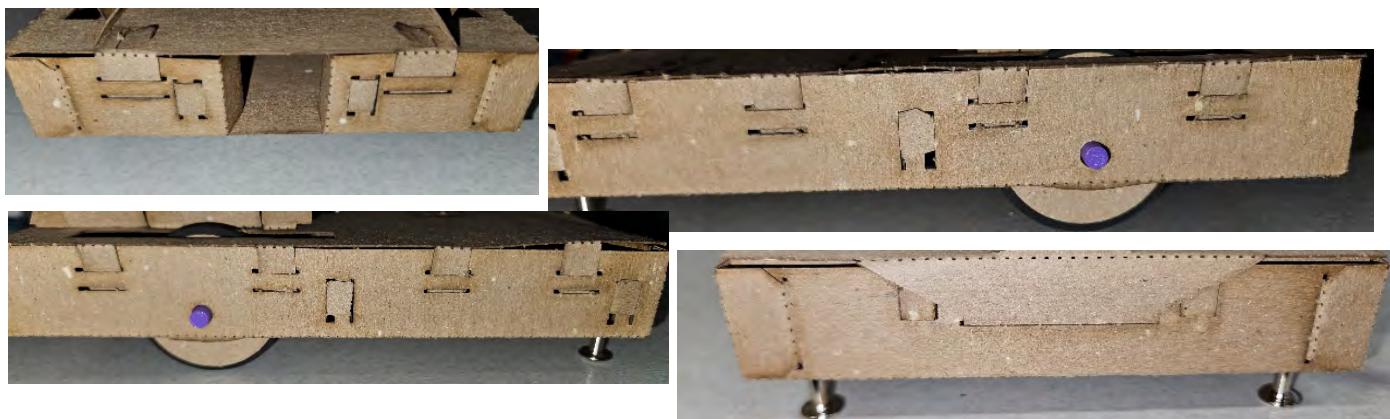
- 117) Screw the large head screw into the 8" zip tie as shown. Screw the horn tip (last hole in horn) to the zip tie. Put the horn back onto the servo at the 8 o'clock position. Thread the zip tie end through the arm and out the thin slot.



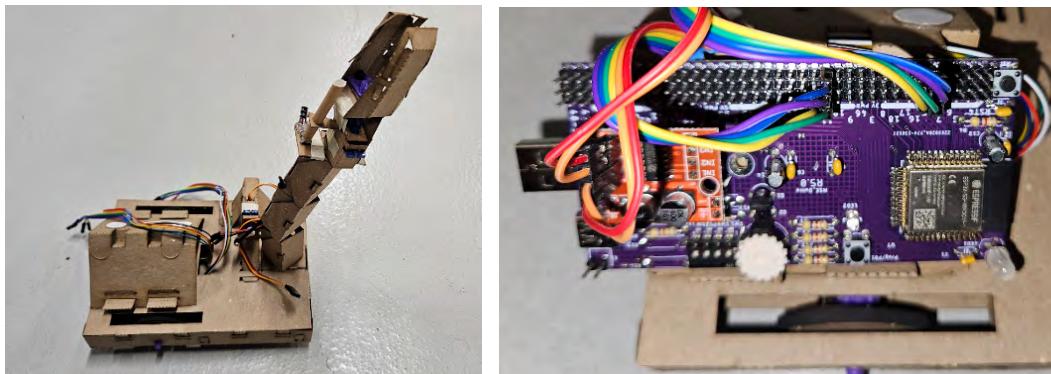
- 118) Take the 4" zip tie and zip it on the end of the 8" zip tie. While holding onto the servo, turn counterclockwise to about 7 o'clock. Hold the arm in the upright position and slide the 4" zip tie down until it touches the arm slot. Cut off the zip of the 4" zip tie and cut off the 8" zip (leaving about 1 to 1.5 cm) above the 4" tie.



- 119) Following Steps 93 to 99 of the MSEbot Chassis Build Instructions, replace the top on to the MSEbot.



- 120) Follow Steps 102 to 105 from the MSEbot Chassis Build Instructions to wire the MSEduino board to the DC gearmotors.



- 121) Feed the two servos and the IR detector wire under the arm servo.



- 122) Wire the arm servo though the board holder to the back of the bot. Then plug the arm servo into port 41, orange wire towards the centre of board. Wire the claw servo wires to a 3 plug to receptacle jumper wire and then to port 42.



- 123) Take a second set of 3 plug to receptacle jumper wires connect to the IR receiver wire ends, taking note of the colours. Feed the jumper wires through board holder towards back of bot. Plug the ground wire into port 14 pin furthest from the board centre. Middle pin to the Vcc of IR receiver and inner pin to signal of the IR receiver.



124) Your bot is complete, proceed to testing.

