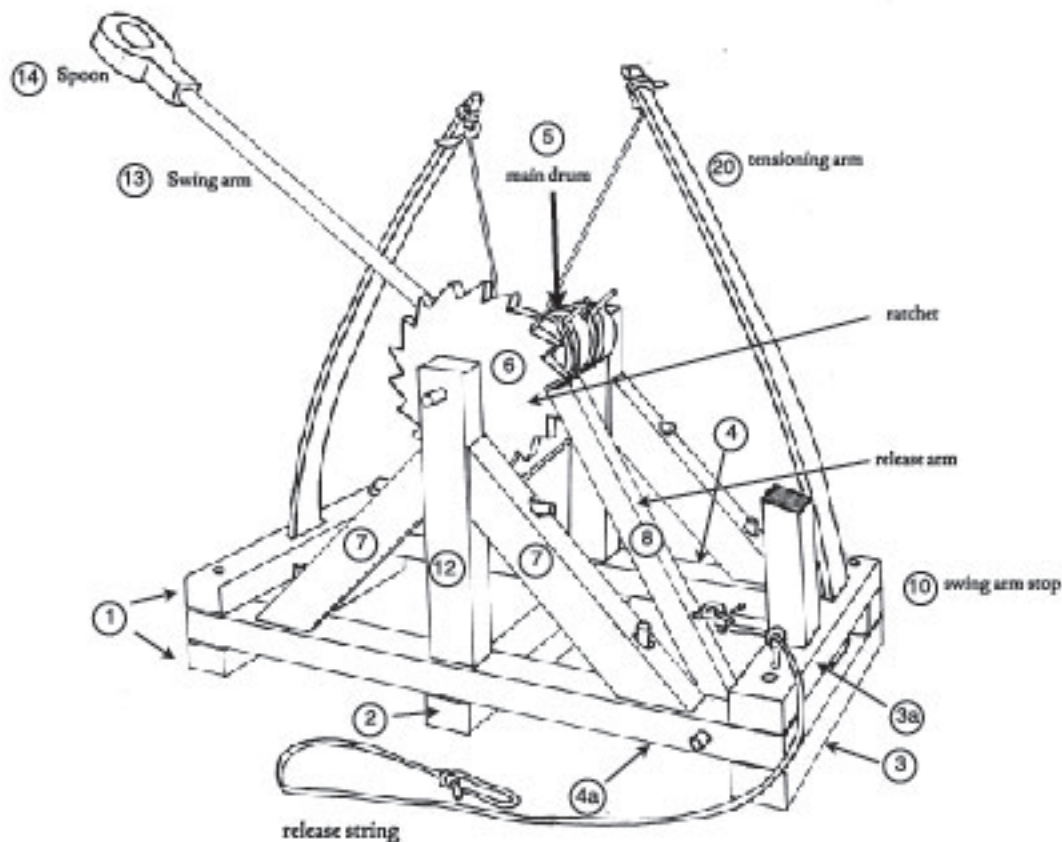


## DA VINCI CATAPULT USER GUIDE

Leonardo da Vinci was a prolific inventor and artist who came up with new ideas and redesigned inventions from earlier times. This catapult is one of his redesigns from the medieval catapults of 400 or 50 years earlier. Only two drawings of his catapult have been found, and we have modified it to make it easier to make, and use, as a working historical model.



# The Leonardo da Vinci Catapult

Catapults were first invented in Ancient Greek and Roman Times, but our common idea of them comes from the types we see in Medieval Times, and used the torsion power of twisted rope to make them work.

Leonardo da Vinci reinvented the catapult somewhat, and used the spring-like energy stored in bent wood to give power to the swing arm.

He made two designs, one had two tensioning arms (top drawing) and the other had a single tensioning arm (bottom). The bottom design used a ratchet and release arm, similar to what we have used, to hold the power of the bent wooden pieces.

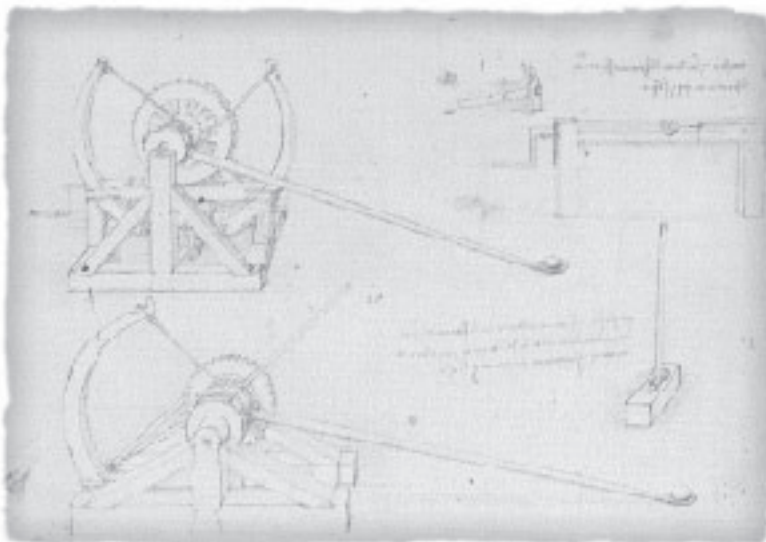
The drawing on the bottom also shows a bar that was inserted into the drum in the middle, to, one push at a time, move the swing arm into firing position. The pressure would have been intense, so the leverage needed would have necessitated a long pole!

The catapult in the top drawing used a winder on the end (left side) attached to a worm gear to move the swing arm into place.

Leonardo also drew a diagram of what the worm gear might look like (top - right). The worm gear would have been wound, turning the large gear and drum, moving the swing arm into position for loading. It was likely that a holding mechanism of some kind was used to hold the drum, and the worm gear was disengaged, so when the swing arm was released the winder didn't rotate wildly (and the swing arm hit the person holding the winder!).

The pressure on a full sized catapult would have been tremendous, and modern recreations have shown this to be true! Check online the Discovery Channel's "Doing da Vinci," to see the construction of a large model.

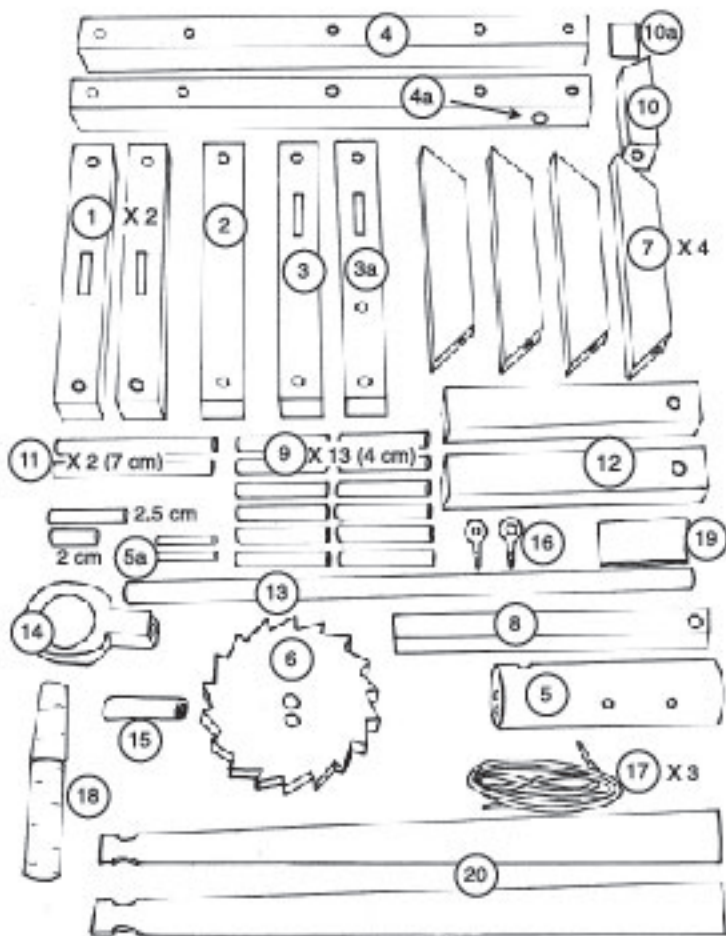
Your kit mixes the designs from both of his drawings, to make it easier to make, and fire. We hope you enjoy the model and have many hours of fun experimenting with different projectiles, tensions of the arms and angles of release of the swing arm.



Some might wonder why Leonardo da Vinci would design a hurling device when gunpowder weapons had been invented and were in use. Perhaps he figured that while the gunpowder based weapons were used in warfare, there were times when a hurling device could still be used effectively. Crossbows and the longbow, as well as swords and other weapons were used at the same time as gunpowder weapons during the late fifteenth and sixteenth century. Slowly, as the reliability of the gunpowder-based weapons improved, these siege engines became obsolete.

## Parts

1. End piece - groove in the middle
2. Middle piece
3. End piece - groove on one side
- 3a. End piece - has hole in the top!
4. Base
- 4a. Base - with hole on the side!
5. Winding drum
- 5a. Small sticks for the drum
6. Ratchet
7. Angled supports
8. Release arm
9. 4 cm dowels (x 3)
10. Swing arm stop
- 10a. Leatherette cushion for 10
11. 7 cm dowels (x 2)
12. Main braces
13. Swing arm
14. Throwing spoon
15. Tube for dowels
16. Screw eyes (x 2)
17. String 45 cm x 3
18. Glue
19. Sandpaper
20. Tensioning arms  
(Clay - not shown)



## Assemble these items:



scissors



glue



ruler



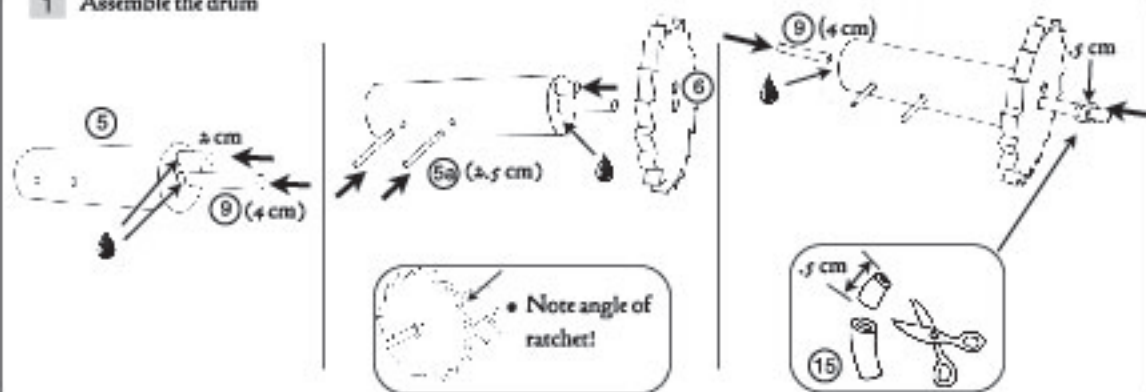
healthy snack!



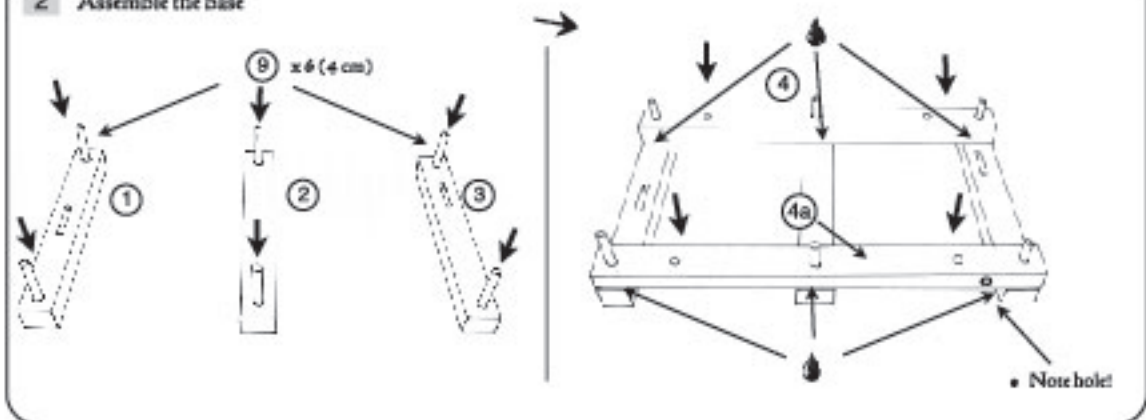
= Add Glue to the  
area indicated

- You can assemble the entire kit without glue, and then go back and glue the pieces, once you like it the way it is.

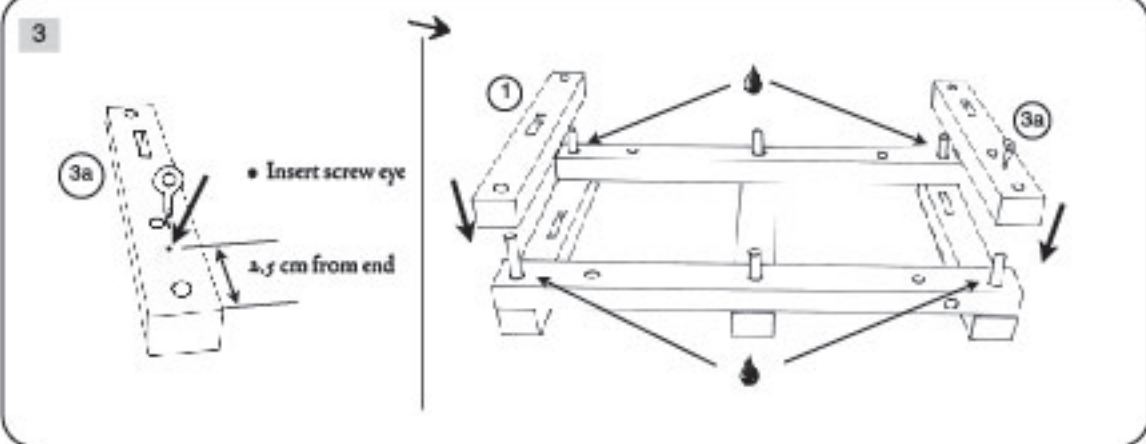
### 1 Assemble the drum

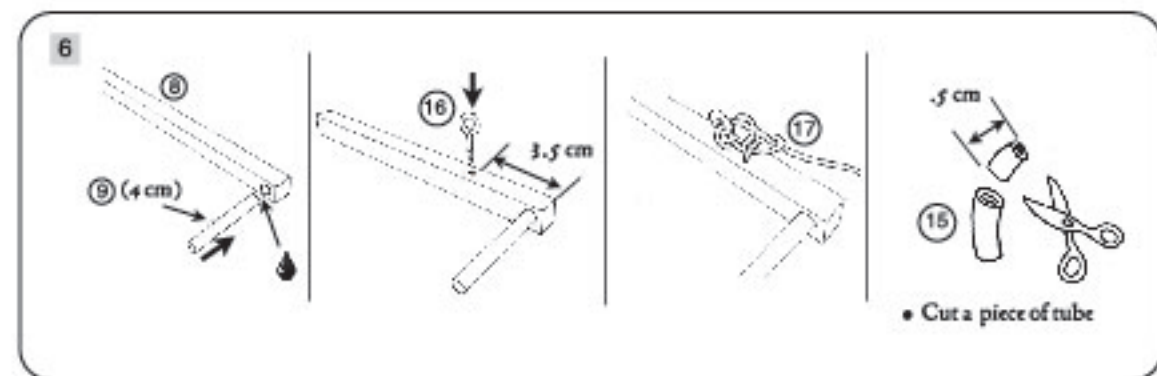
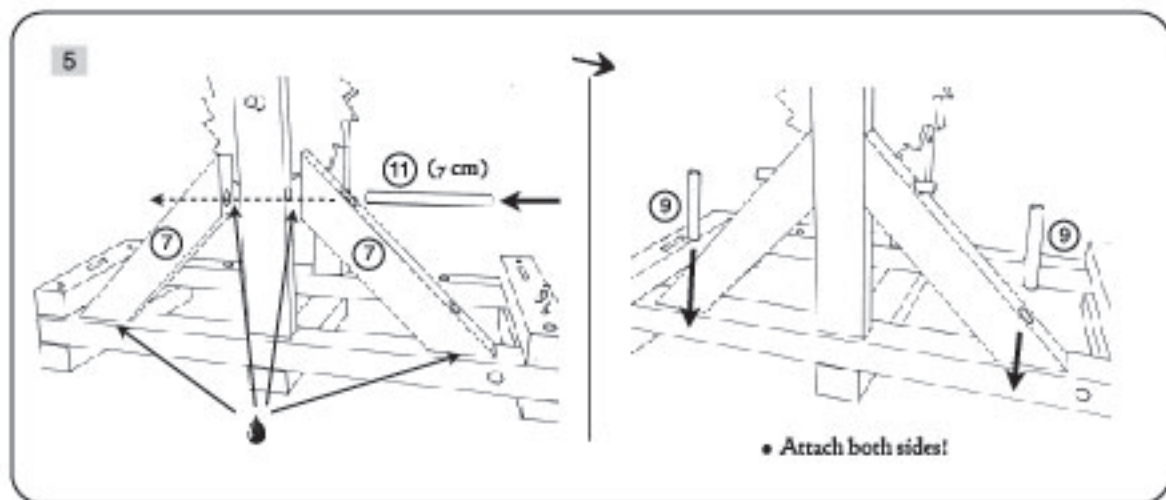
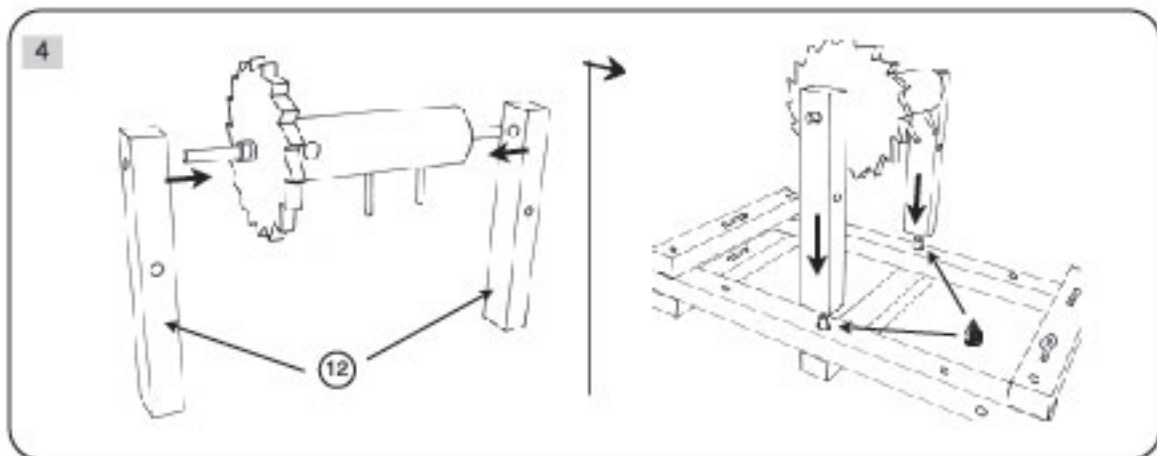


### 2 Assemble the base

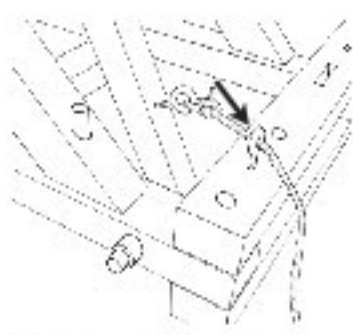


### 3





**7 Add the release arm**

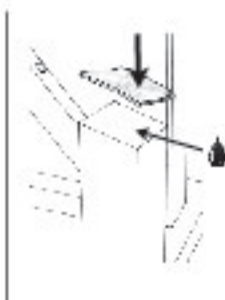
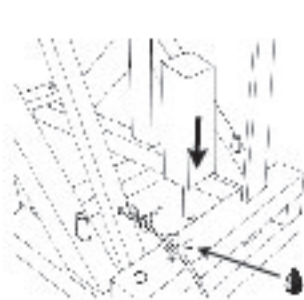
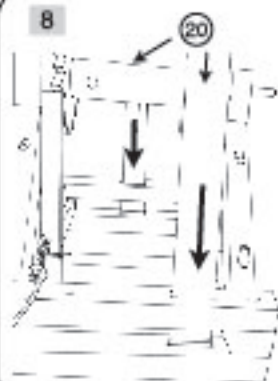


• Slide the string through the screw eye

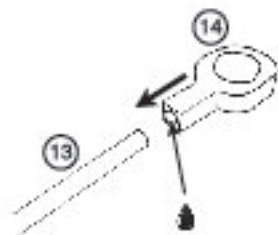


• Snack time!

**8**



**9 Add the swing arm**



• Spoon faces down

10

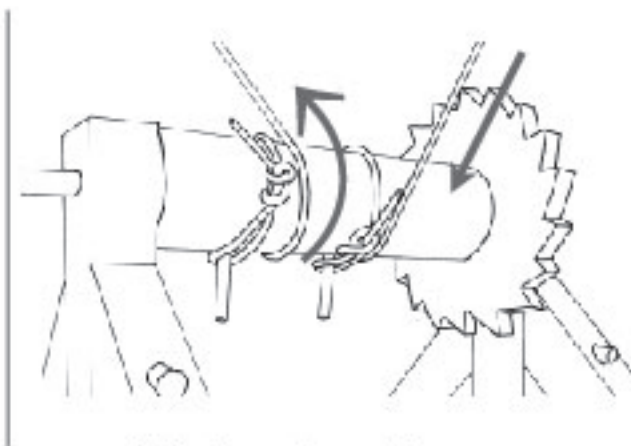


- Make a small loop in the ends of the 2 strings.

11

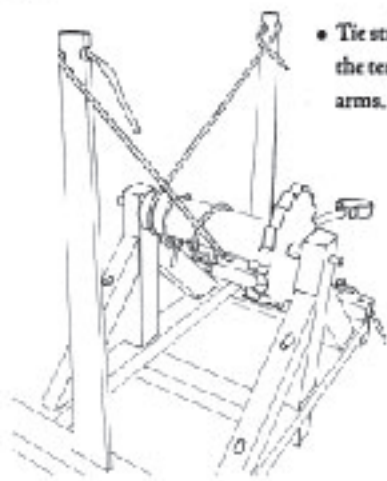


- Place the loops over the drum and sticks

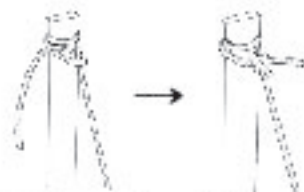


- Both strings on the same side!

12



- Tie strings to the tensioning arms.



- Easy! - keep the knots a bit loose, you will need to tighten them later.

- Finish your snack and sit back and admire your work!



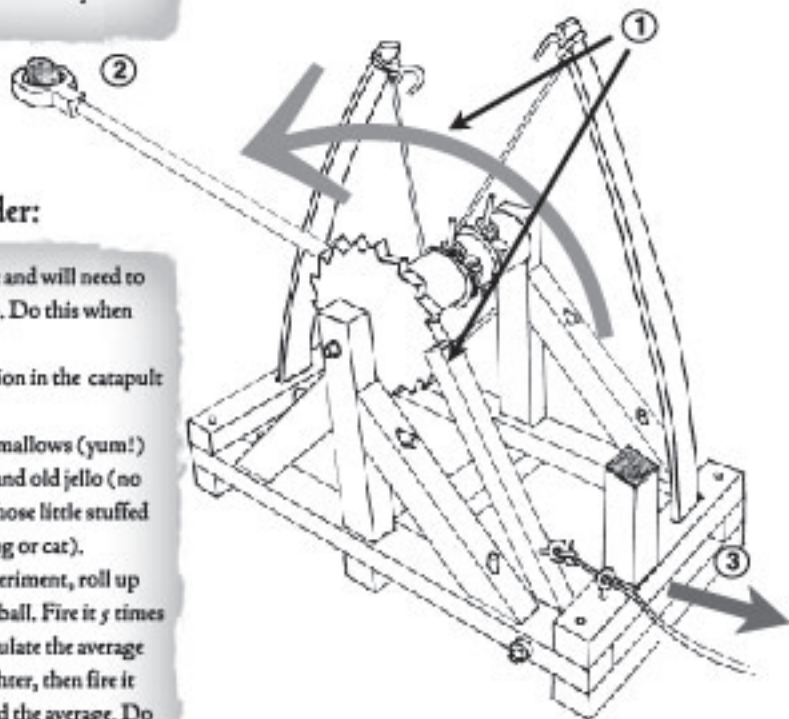
## Firing the Catapult

- 1 Swing the swing arm to the firing position and place the release arm under the ratchet.
- 2 Make a small clay ball and place it in the spoon.
- 3 Aim the catapult and pull the string - stay to the side so the swing arm doesn't hit you!

This kit is designed to fire a small clay ball about 14 feet (4 m.). Tightening the string too tight will give a longer throw, but you might break the swing arm, or the tensioners. That will make your siege short lived, so please accept the limitations of the model!

## Some Things to Consider:

- The strings will stretch over time and will need to be tightened (but not too tight!). Do this when needed.
- When not in use, release the tension in the catapult so it is not under load.
- Try firing other items like marshmallows (yum!) cotton balls, small bouncy balls and old jello (no wait - not jello!). Dog treats or those little stuffed mice are also fun (if you have a dog or cat).
- As a neat math and graphing experiment, roll up some aluminum foil into a loose ball. Fire it  $y$  times and record the distance, then calculate the average distance. Squish the ball a bit tighter, then fire it again, record the distance and find the average. Do this a few times and then graph the results. Why do you think the distance changed?
- The clay that comes with the kit needs to be stored in the package when not in use so it doesn't dry out.
- Dressing up like Leonardo da Vinci, presenting the catapult as a show-and-tell item in school or at work will make you 23% more popular (if that is important to you).



Imported & Distributed by  
Thumbs Up (UK) Ltd  
Ruislip, Middlesex, HA4 0EJ, UK  
[www.thumbsupuk.com](http://www.thumbsupuk.com)