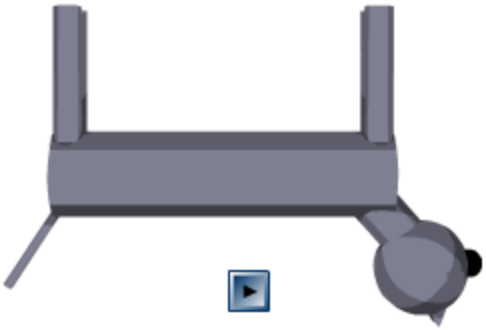
A Cat Always Lands on Its Feet

It is true that when an upside-down cat is dropped from a height it almost always lands on its feet.

This might seem to be impossible, violating principles like Conservation of Angular Momentum.

The way the cat does this feat involves five steps.

In the first step it brings in its front legs. Clicking on the blue arrow will demonstrate.



To conserve angular momentum, the cat must arch its back a bit while it brings in its front legs; I do not show this in the animation.

Click here for the next scene:

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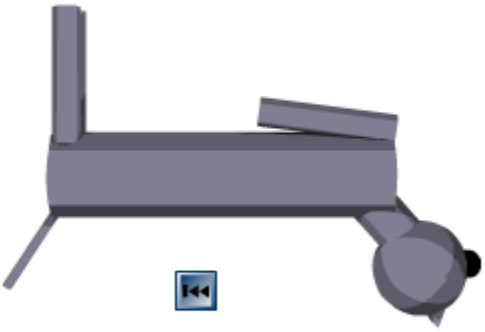

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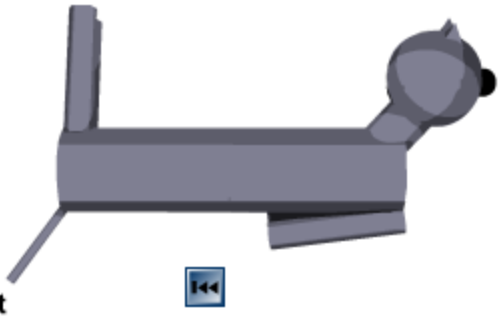
Click here for the next scene:

Step 2

Next the cat rotates it front half and back half in opposite directions about its longitudinal axis.

But since it has pulled in its front legs, the rotation of its front half is much greater than the rotation of its back half.

Click on the blue arrow to see a demonstration.



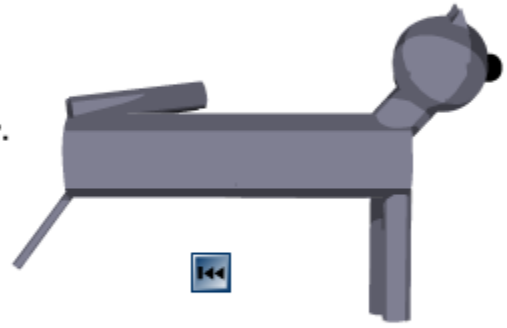
Technically, we can say that the moment of inertia of its front half is much less than its back half. So doing these different amounts of rotation conserves angular momentum.

Note that this requires great flexibility!

Step 3

Next the cat extends its front legs, and withdraws its rear legs close to its body.

Clicking on the blue arrow will demonstrate.

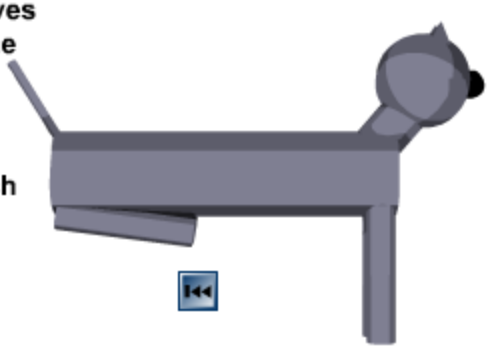


Step 4

Now the cat rotates it front and back halves about its longitudinal axis, this time in the opposite directions to its first rotation about this axis.

The rotation of the cat's back half is much greater than its front half

Clicking on the blue arrow will demonstrate.



Step 5

Finally, the cat extends its back legs and it is ready to land on its feet.

Similar to the first step, when the cat pulled in its front legs, here extending its back legs causes its back to un-arch a bit. I do not show that in the animation.

Clicking on the blue arrow will demonstrate.