

Dynamics and Statics

Angular Momentum with a frying pan

(Ireland)

Background

It is recommended that a table-tennis bat is used instead of a frying pan for reasons of health and safety.

If a pancake is flipped and lands back in the frying pan it may not reveal any unusual science.

However if a table tennis bat (red on one side and black on the other) is used in lieu of a frying pan and a CD is used in lieu of the pancake then an interesting feature of angular momentum may be revealed.

You will need...

- ✓ a table-tennis bat
- ✓ a CD
- ✓ a book
- ✓ A toy mobile phone (or similar flat rectangular object).

Follow these steps

1. With the CD flat on the surface of the table tennis bat, flip the CD so that it lands on the bat (reverse side of CD uppermost).
2. Remove the CD.
3. Now flip the bat on its own. When caught by the handle the black-side of the bat will be uppermost (if originally the red side had been up).

So what happened?

Clearly the bat performed a half rotation around an axis other than the one about which it was flipped, and additional to that rotation. This is strange behaviour indeed. Perhaps when students study “moments of inertia” and the “perpendicular axes theorem” in Dynamics at a later stage in their careers they will better appreciate why this event has occurred. The principle of Conservation of angular momentum requires the unanticipated twist.

What next?

- Show that similar behaviour occurs when ordinary flat rectangular objects like a book are flipped.
- It is worth choosing a book which has a different colour on its front and back covers. Encourage observers to note whether any writing is upside-down or not, and whether the spine of the book is to the left or right. The height of the toss may need to be different than worked for the table-tennis bat. Be sure to flip about the shorter axis.

