

Let's Boomerang!

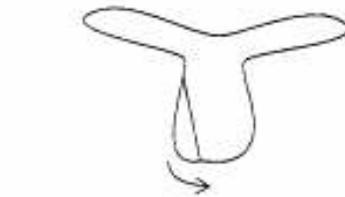
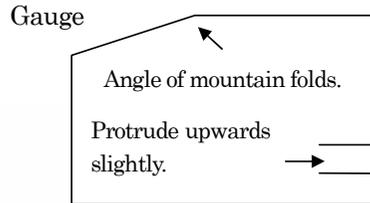
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How to make

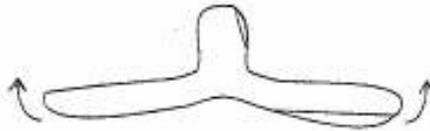
1. Get a thick piece of cardboard. (0.5-0.7mm).
2. Place carbon paper on top of the cardboard; then place the boomerang pattern on top of the carbon paper.
3. Trace the shape of the boomerang onto the carbon paper with a ballpoint pen. Don't forget to trace the dotted line along the wing!
4. Draw a mark on the front side to distinguish it from the backside.
5. Neatly cut out the cardboard boomerang with scissors.
6. Place the boomerang on a flat surface and straighten it if it is bent.
7. Place a ruler along the dotted lines. Using a ballpoint pen, firmly trace over the dotted lines two or three times to make folding the wings easier.
8. Make mountain folds on each wing at an angle of 10-30 degrees. (If left-handed, make valley folds)

How to throw

1. Hold one wing of the boomerang between your thumb and index finger, with the front side facing you (if left-handed, hold boomerang with the back side facing you).
2. Hold boomerang vertically.
3. As you throw the boomerang, just before you release it snap your wrist to make boomerang spin more.
4. Throw the boomerang straight at eye level, as if throwing a dart.



(1) Mountain folds (10-30 degrees).



(2) Protrude upwards slightly.



Everyone can!

Let's try a fantastic experiment.

How it flies

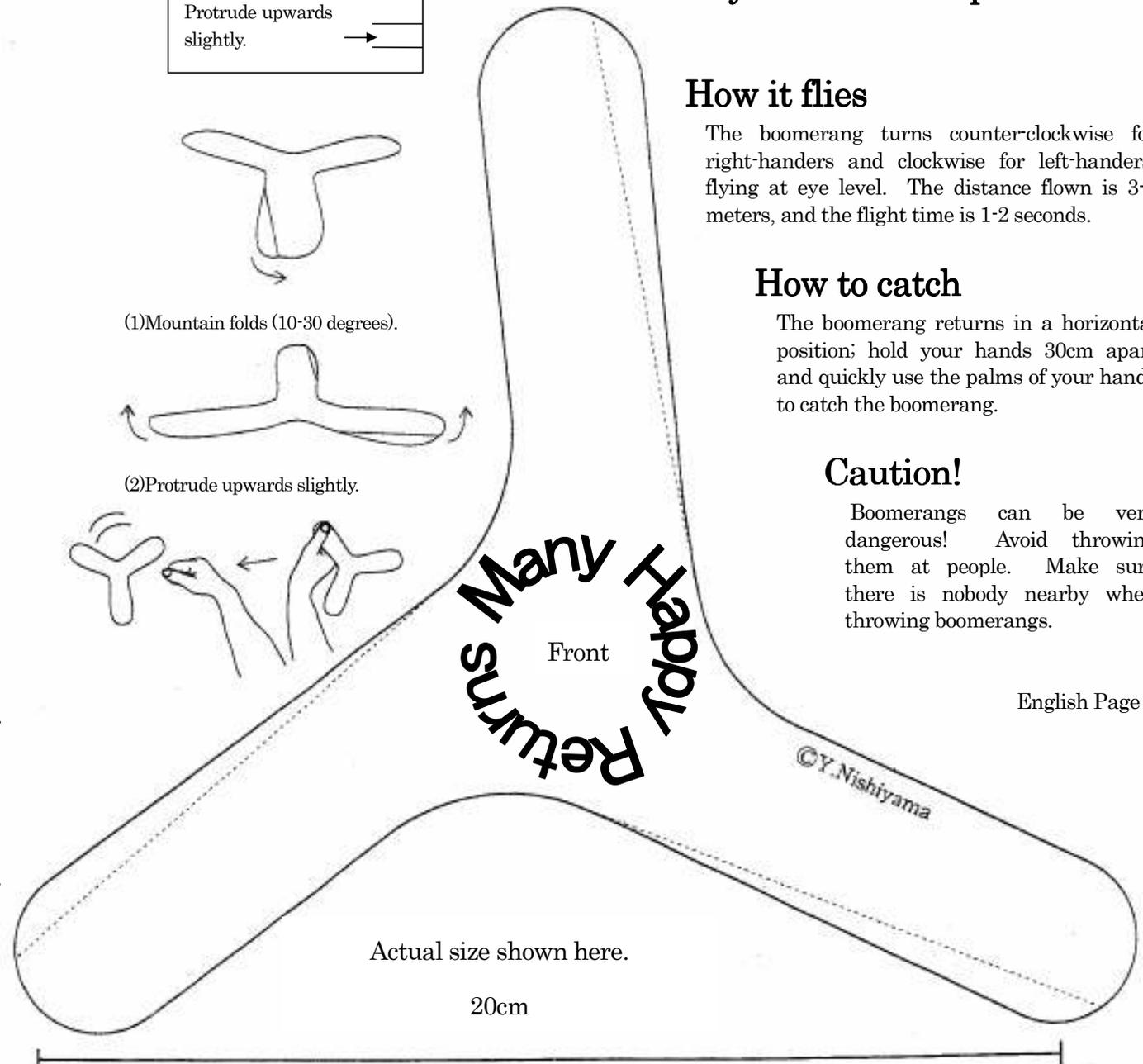
The boomerang turns counter-clockwise for right-handers and clockwise for left-handers, flying at eye level. The distance flown is 3-4 meters, and the flight time is 1-2 seconds.

How to catch

The boomerang returns in a horizontal position; hold your hands 30cm apart and quickly use the palms of your hands to catch the boomerang.

Caution!

Boomerangs can be very dangerous! Avoid throwing them at people. Make sure there is nobody nearby when throwing boomerangs.



Why Does a Boomerang Come Back?

As a boomerang flies through the air vertically it is also spinning. While it is spinning and moving forward through the air, the wing at the top of the spin has a higher velocity than the wing at the bottom of the spin. The difference in velocity creates a difference in lift: the upper wing has a greater lift than the lower wing. Since the boomerang is rotating on an axis and the lift is greater at the top of the rotation, the force applied causes the direction of movement of the boomerang to turn to the left, and the boomerang returns. This is similar to a spinning top, which turns to avoid falling. This is called gyroscopic precession.

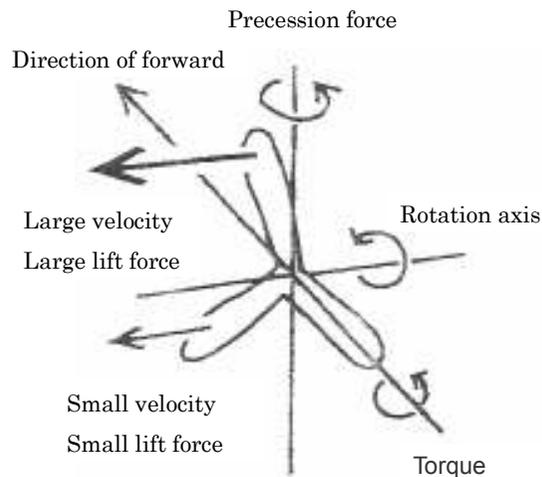


Fig.1 Explanation of left turn

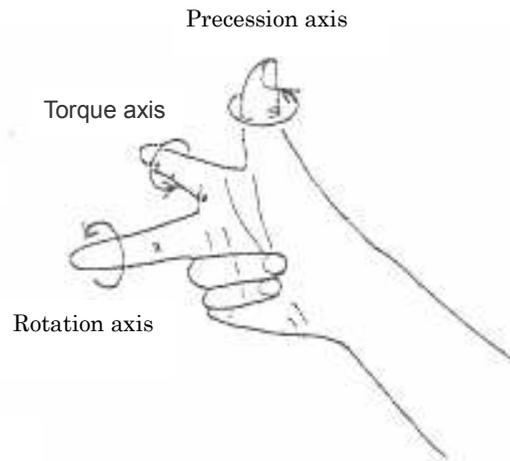


Fig.2 Right-hand rule

Home Page of Boomerang Association

- Japan Boomerang Association (J B A) <http://www.jba-hp.jp/>
- Kansai Boomerang Network (K B N) <http://www.kbn3.com/>
- United States Boomerang Association (U S B A) <http://www.usba.org/>
- International Federation of Boomerang Associations (I F B A) <http://www.ifba-online.com/>