PAPER BOOMERANG

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EXPERIMENT PURPOSE

Observing trajectories of different specs of boomerangs

MATERIALS

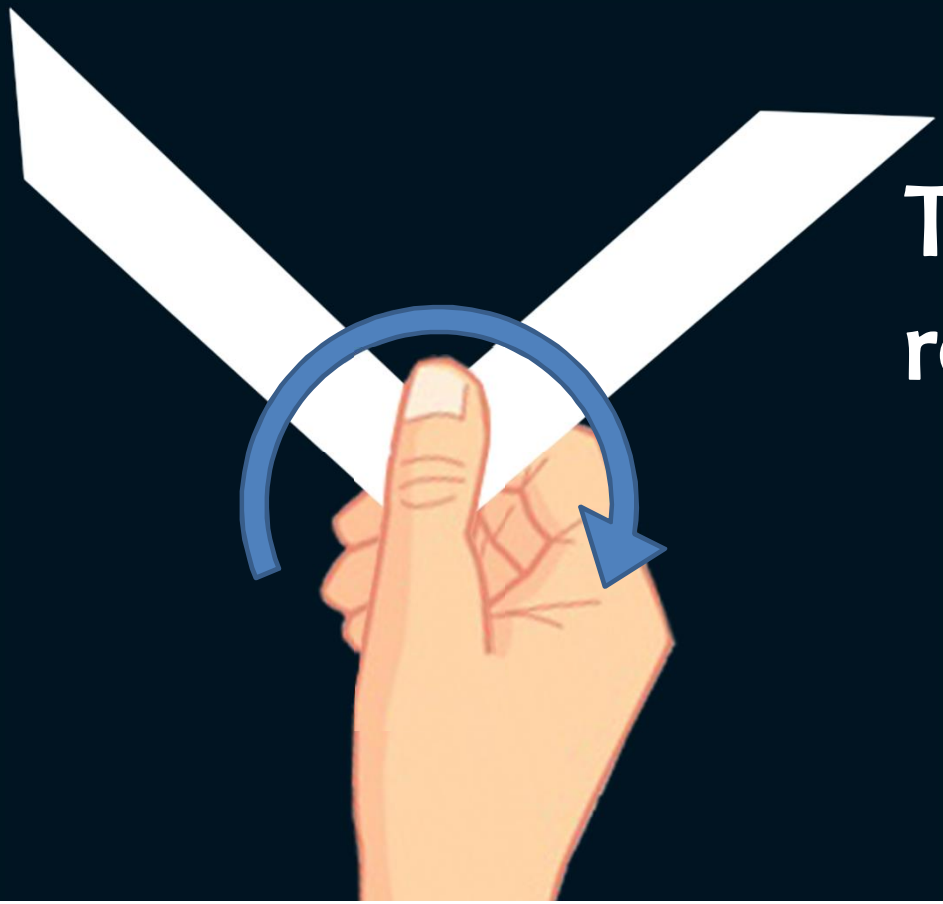
WHITE

(wt. 2.6g, wing length 15cm)

BATIK

(wt. 4.6g, wing length 17cm)

METHODS



Throw it straight while rotating to the right.

HYPOTHESIS

The white boomerang will return within a turning radius of 1m.

The batik boomerang possibly won't return due to a turning radius.

RESULTS

Both of the boomerang didn't return. But the boomerang have a similar trajectory.

DISCUSSION

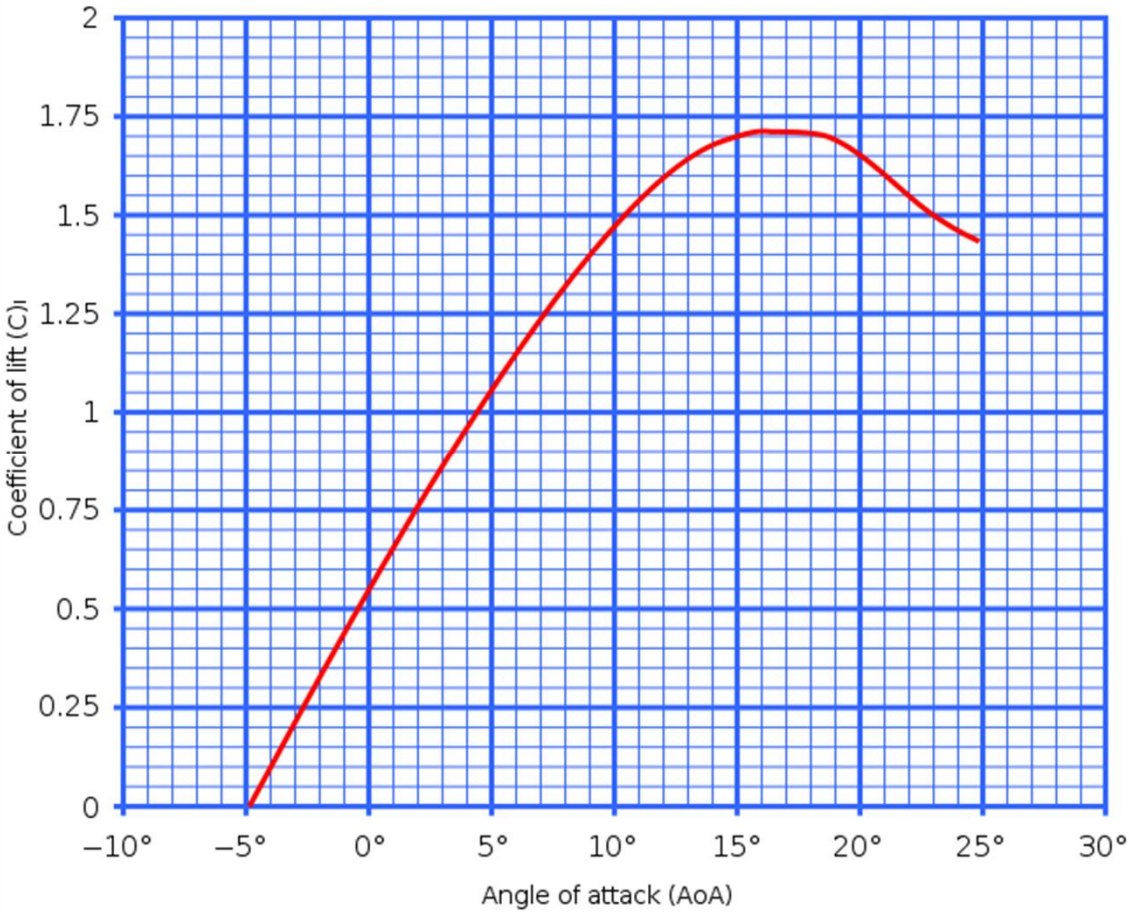
ON EARTH

As we throw the boomerang, the boomerang generates lift. So, it goes up. As the boomerang generates lift, the angle of attack will change. This causes the coefficient of lift to change as well.

ON EARTH

$$Lift = C_L \times S \times \left(\frac{1}{2} \times p \times v^2\right)$$

Due to the change of coefficient of lift, the amount of lift also changes.



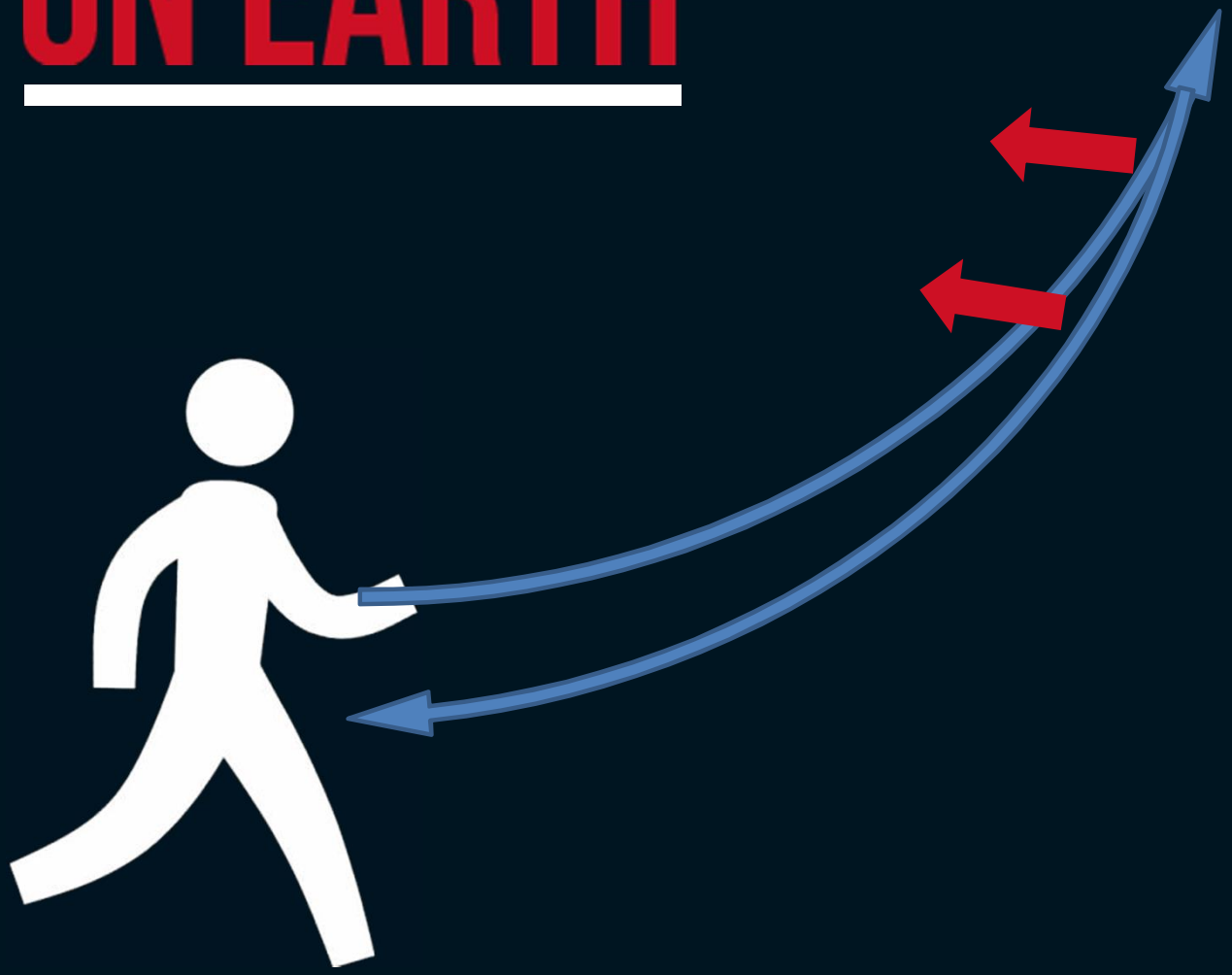
C_L = Coefficient of Lift

S = Surface Area

P = Density of the Air (Altitude)

v = Velocity of the Air (TAS)

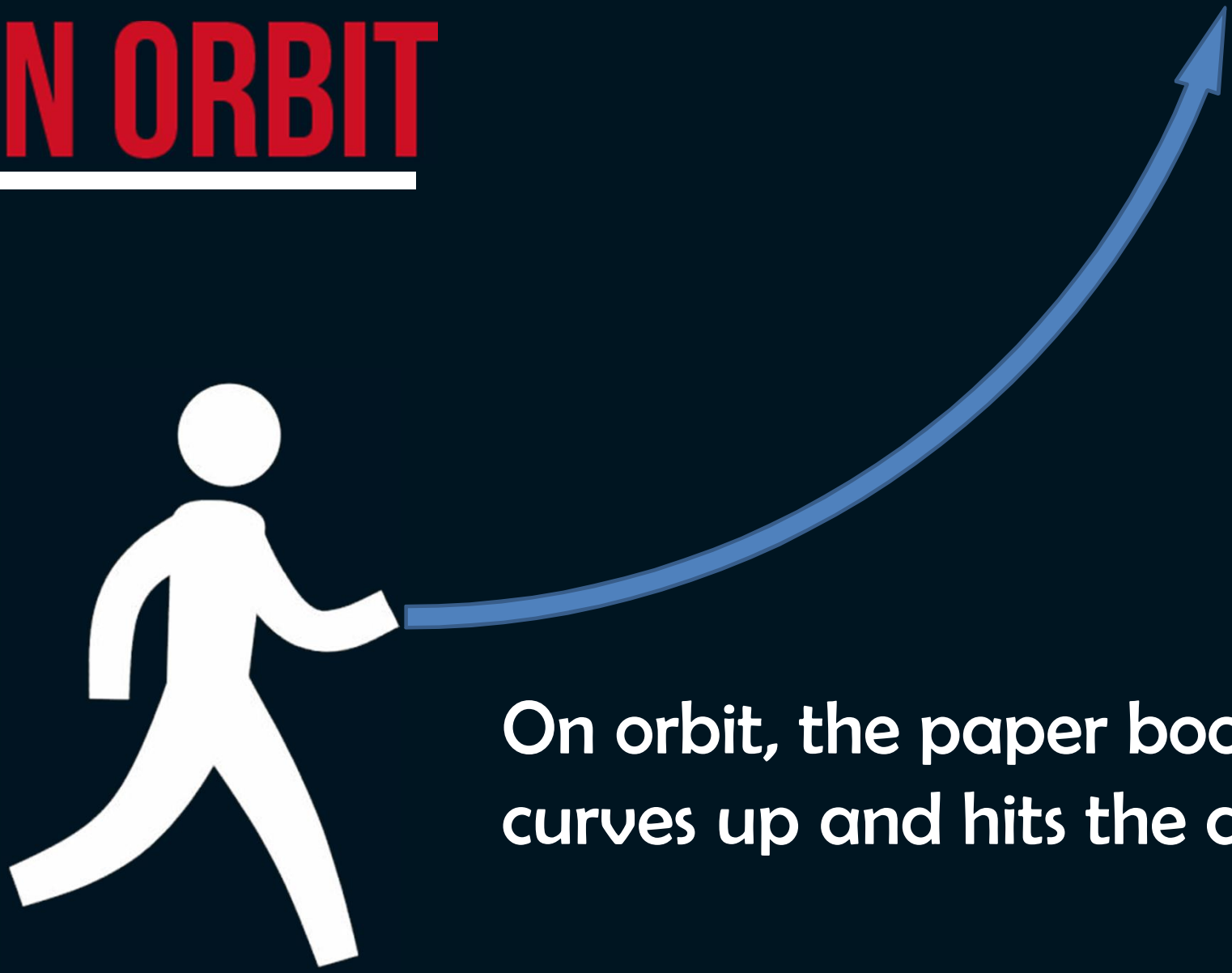
ON EARTH



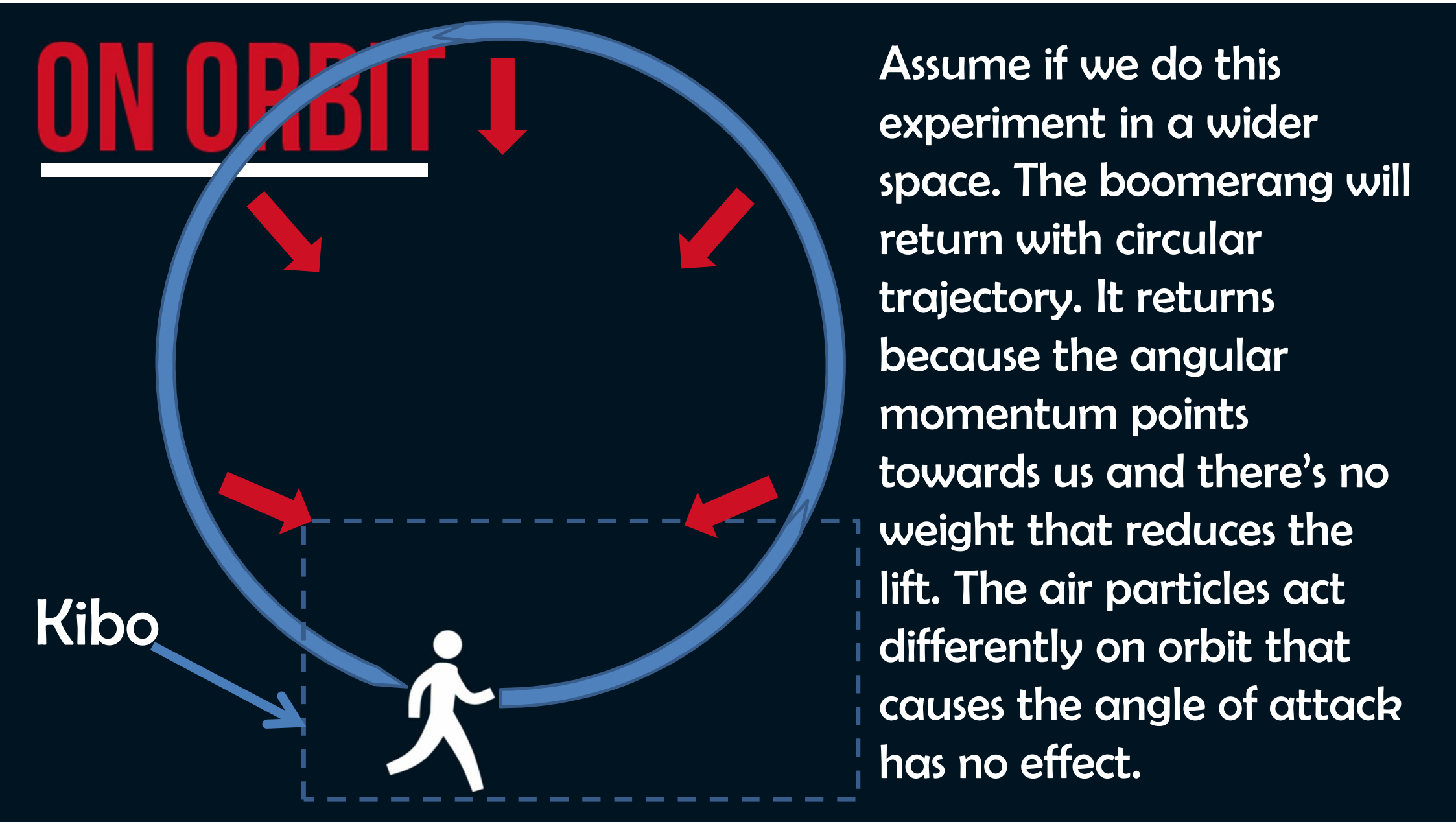
At peak of the trajectory, the amount of lift equals to weight. Then boomerang returns due to angular momentum.

= direction of angular momentum

ON ORBIT

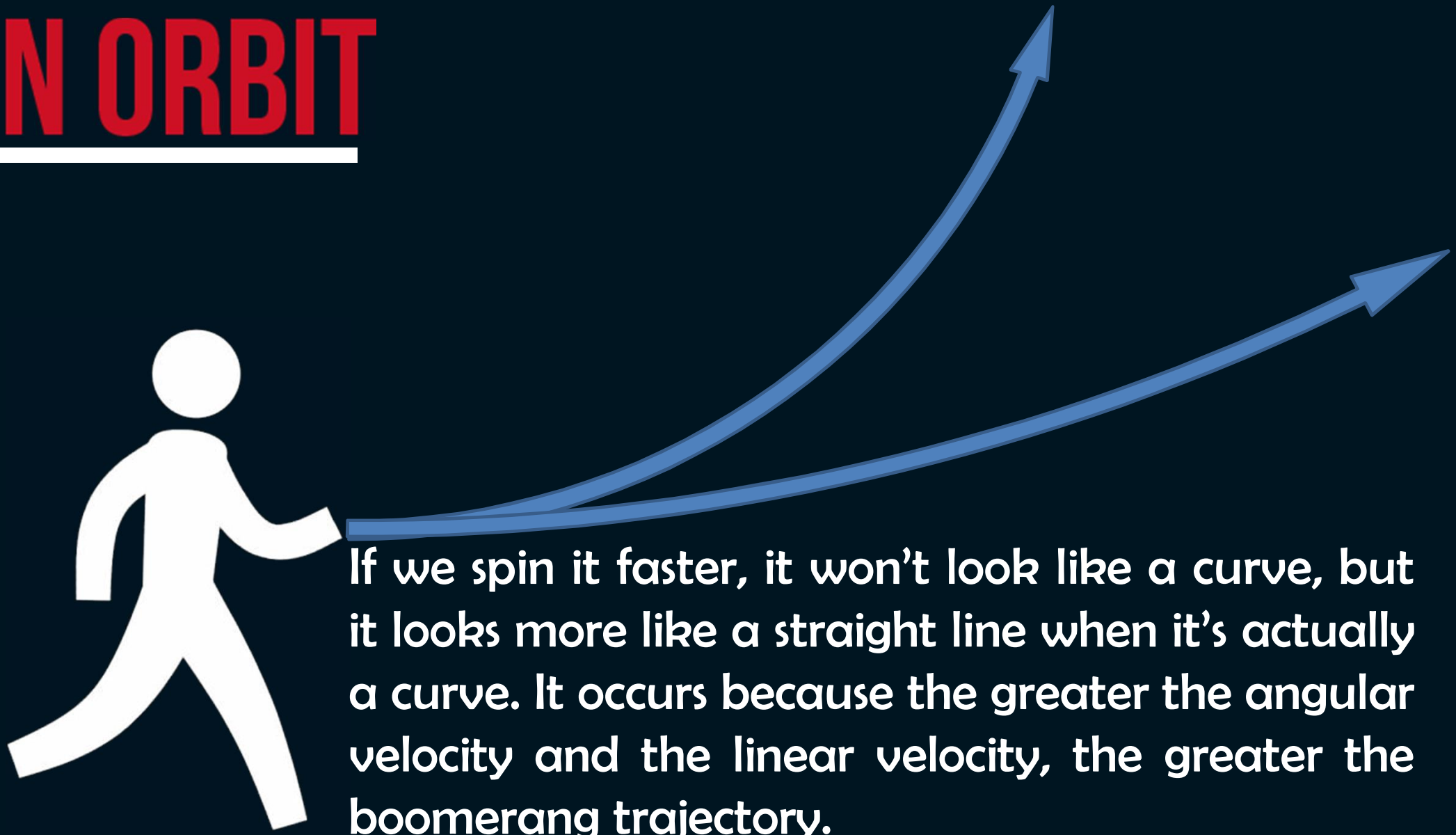


On orbit, the paper boomerang curves up and hits the ceiling.



Assume if we do this experiment in a wider space. The boomerang will return with circular trajectory. It returns because the angular momentum points towards us and there's no weight that reduces the lift. The air particles act differently on orbit that causes the angle of attack has no effect.

ON ORBIT



If we spin it faster, it won't look like a curve, but it looks more like a straight line when it's actually a curve. It occurs because the greater the angular velocity and the linear velocity, the greater the boomerang trajectory.

ON ORBIT

The greater the angular velocity and the linear velocity, the bigger the circular boomerang trajectory will occur.

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