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參展科別 物理與太空科學科

作品名稱 **The gyroscopic effect of bicycle wheels**

得獎獎項 二等獎

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ABSTRACT OF EXHIBIT
TAIWAN INTERNATIONAL SCIENCE FAIR

The **aim** was to determine whether there is an amount of gyroscopic force that keeps a bicycle wheel upright and stable.

Two **hypotheses** were used, the first being as the mass of a wheel increases so does the force required to tilt the wheel by thirty degrees and the second that as the speed at which the wheel is spun increases so does the force required to tilt the wheel.

Procedure

Bicycle wheels of the same diameter were acquired and set up on a rigging system one at a time. A wireless speedometer was attached to each wheel. An electric motor was used to spin the wheels at four speeds: 10km, 20km, 30km and 40km per hour. The force required to tilt the wheels by a thirty degree angle was recorded for each wheel from a static position as well as at each speed setting, was measured with a Newton meter. The formula $F \propto I\alpha$ (where F= force, I = moment of inertia and α = angular acceleration) was used to see whether a theoretical relationship existed (whereby an increase in the wheels mass caused an increase in the force required to tilt the wheel and an increase in speed caused the same) that matched the physical relationship that would be seen as evidence gathered from the experiment.

Data

The forces recorded when each wheel was tested from a static position showed that as the mass of the wheel increased so did the force required to tilt the wheel. The lightest wheel required 10N of force while the heaviest required 16N of force. The data when concerning the speed at which the wheel was spun was erratic, however it was possible to see that as the speed became greater than twenty kilometres per hour the force required to tilt the wheel increased. While the increase was not very large, an increase in force was none the less recorded. This was seen for all the wheels tested.

Conclusion

Concerning the mass of the wheel the hypothesis was proven to be true, the higher the mass of the wheel the larger the force required to tilt the wheel by thirty degrees. The hypothesis concerning speed was also proven to be true however this was only seen

clearly when the speed was greater than twenty kilometres per hour. The theoretical calculations using the formula as previously stated proved both hypotheses correct.

評語

1. Good topic trying to find out the effectiveness of gyroscopic effect of bicycle wheels.

2. Experiment can truly reflect partial contribution of the gyroscopic effect during rotation.

評語