

ASIAN TRY ZERO-G 2017/18

GYROSCOPE IN MICRO-GRAVITY

BY SINGAPORE

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(1) Purpose of Experiment

- On earth, it is only possible to measure 2 axis of stability.(Up-Down, Left-Right).
- In space, there is a third(Up-Down) dimension added.
- On Earth, we are used to the gravitational field strength being 9.8N/Kg .
- In space, we are not under this familiar force of gravity.
- This will defy nearly all intuition of our experience on earth.

(2) Materials & Methods

- Materials:
 - Gyroscope
 - Weights
- Methods:
 1. Suspend spinning gyroscope and make a visual observation
 2. Push gyroscope gently and make a visual observation
 3. Stop gyroscope and hang weight onto gyroscope
 4. Spin gyroscope and make visual observation
 5. Stop gyroscope gently and make hang all 3 weights onto the gyroscope
 6. Spin gyroscope and make visual observation

*When making visual observation, observe stability and precession.

(3) Hypothesis

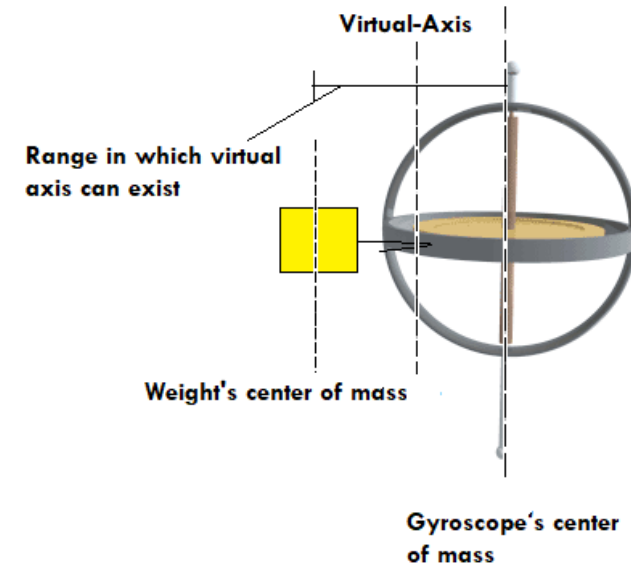


- No weights :
 - The gyroscope maintains its vertical axis and resists any change from its state of equilibrium(very stable).
- One weight:
 - The gyroscope will rotate with the weight parallel to the ground.
- Three weights:
 - The gyroscope will rotate with the combined centre of mass of the weights parallel to the ground.

(4) Result

	Did Hypothesis Match Results?
No weights	YES
One weight	NO
Three weights	NO

- No weights :
 - The gyroscope maintains its vertical axis and resists any change from its state of equilibrium(very stable).
- One weight:
 - The gyroscope rotates about its 'virtual axis' of rotation which is the virtual point between the vertical axis and the weight
 - The gyroscope is less stable.
- Three weights:
 - The gyroscope rotates about its 'virtual axis' of rotation and the effect of gyroscopic precession is greatly magnified.
 - The gyroscope is even less stable than with one weight.



(5) Discussion

- The gyroscope with weights will try to reach a state of equilibrium which accounts for the surface resistance(friction) and gravity.
- These are inhibiting factors and hence will cause the gyroscope's motion(conservation of angular momentum) to 'masked' under the true factors.
- On earth, the surface on which the gyroscope is balancing on inhibits its motion however, in space, we are able to observe the gyroscope's true motion.

Questions for Kanai-san

- 1) Could you feel the gyroscope resisting your push as you were conducting the first part of the experiment?
- 2) Was the gyroscope easier or harder to push when the weights were attached?

Thank You