



GYROSCOPE AND GYROMETER

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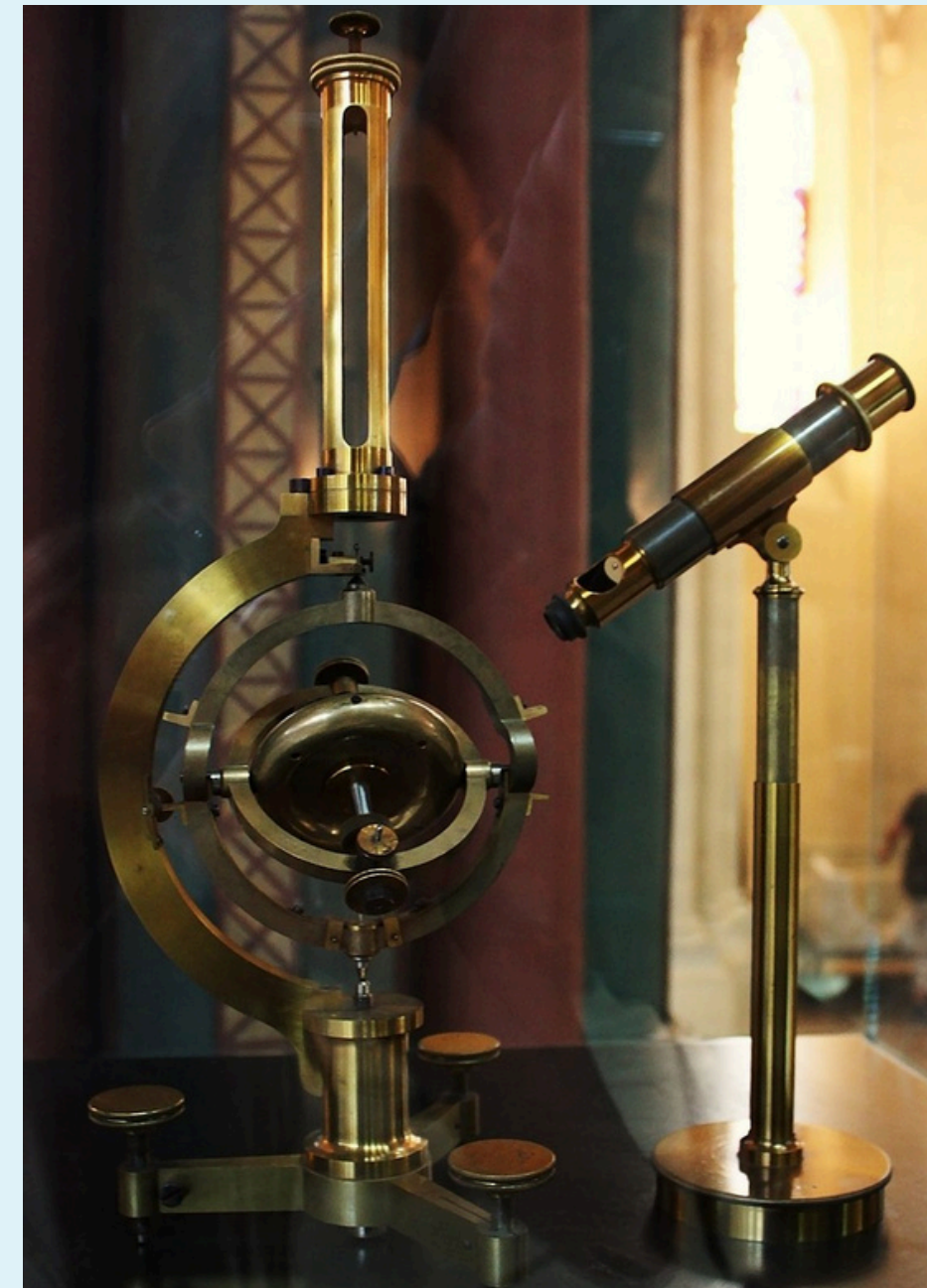
1. Introduction - History

The first gyroscope

- In 1852 Léon Foucault invented the gyroscope to demonstrate the Earth's rotation. [1]



Léon Foucault [2]



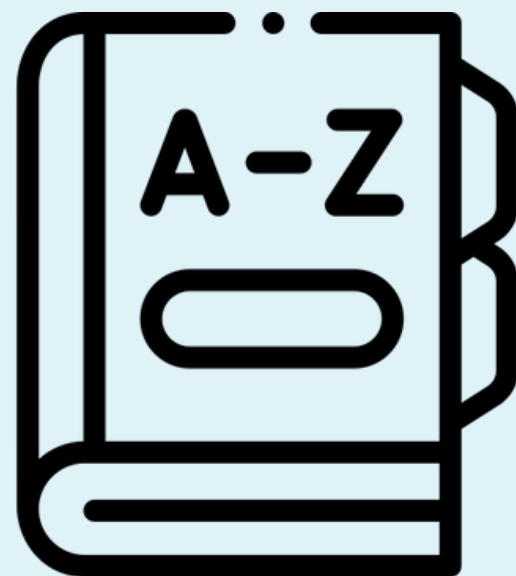
Replica of Foucault's gyroscope [1]

1. Introduction - Etymology

Gyroscope

A combination of:

- **gyro-** (Greek gýros meaning “ring, circle”)
 - **-scope** (Greek skopeîn meaning “to look at”)
- [3]

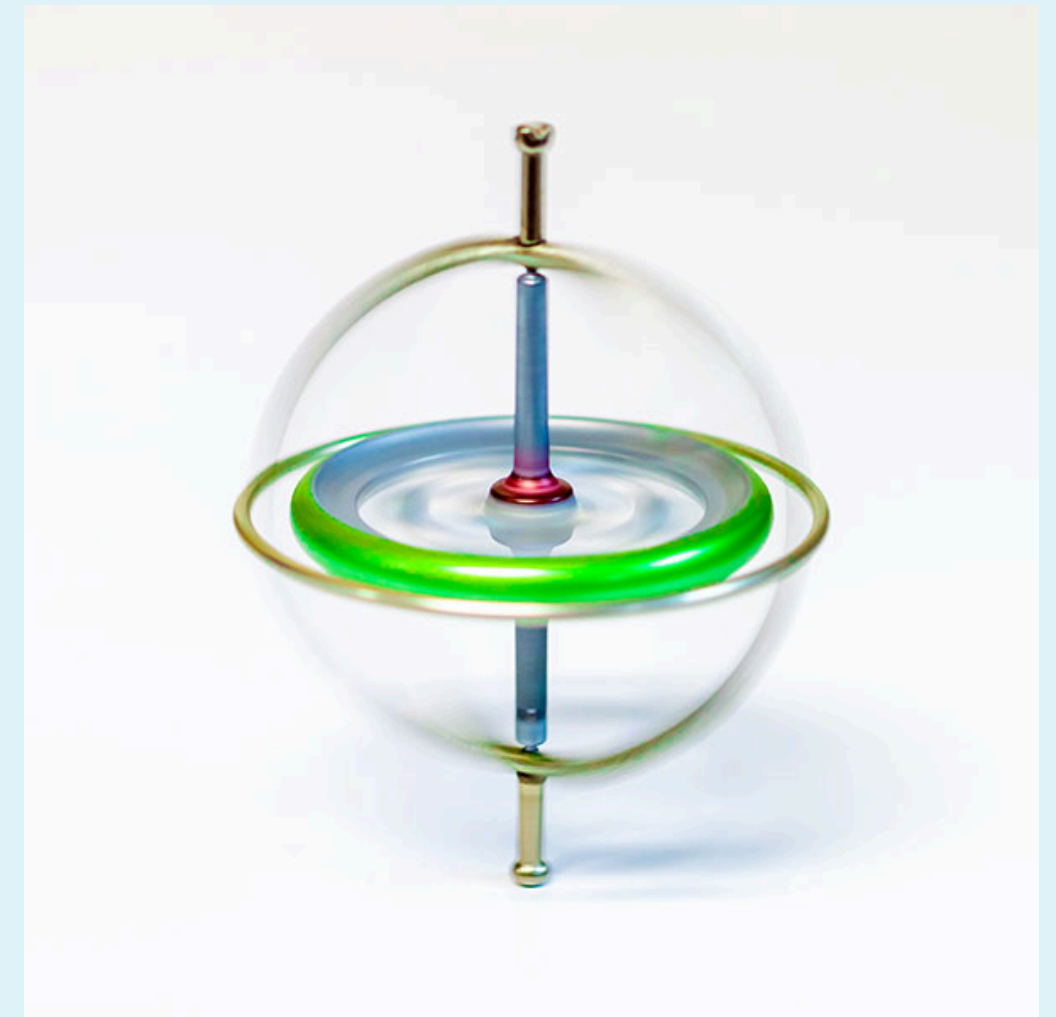


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1. Introduction - Definition

Gyroscope

- Instrument that determines orientation in space.
- Detects angular position. [5]



[5]

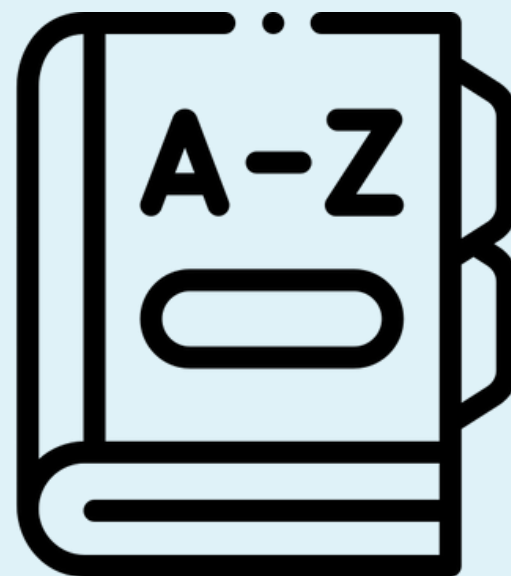


1. Introduction - Etymology

Gyrometer

Composed of :

- gyro-(Greek gêros meaning “ring, circle”)
 - -meter (from the Greek metron, “measure”)
- [6]



[7]

1. Introduction - Definition

Gyrometer or Rate Gyroscope

- Motion sensor measuring angular velocity on one or three axes simultaneously.
- Reference: inertial frame. [5]



[7]



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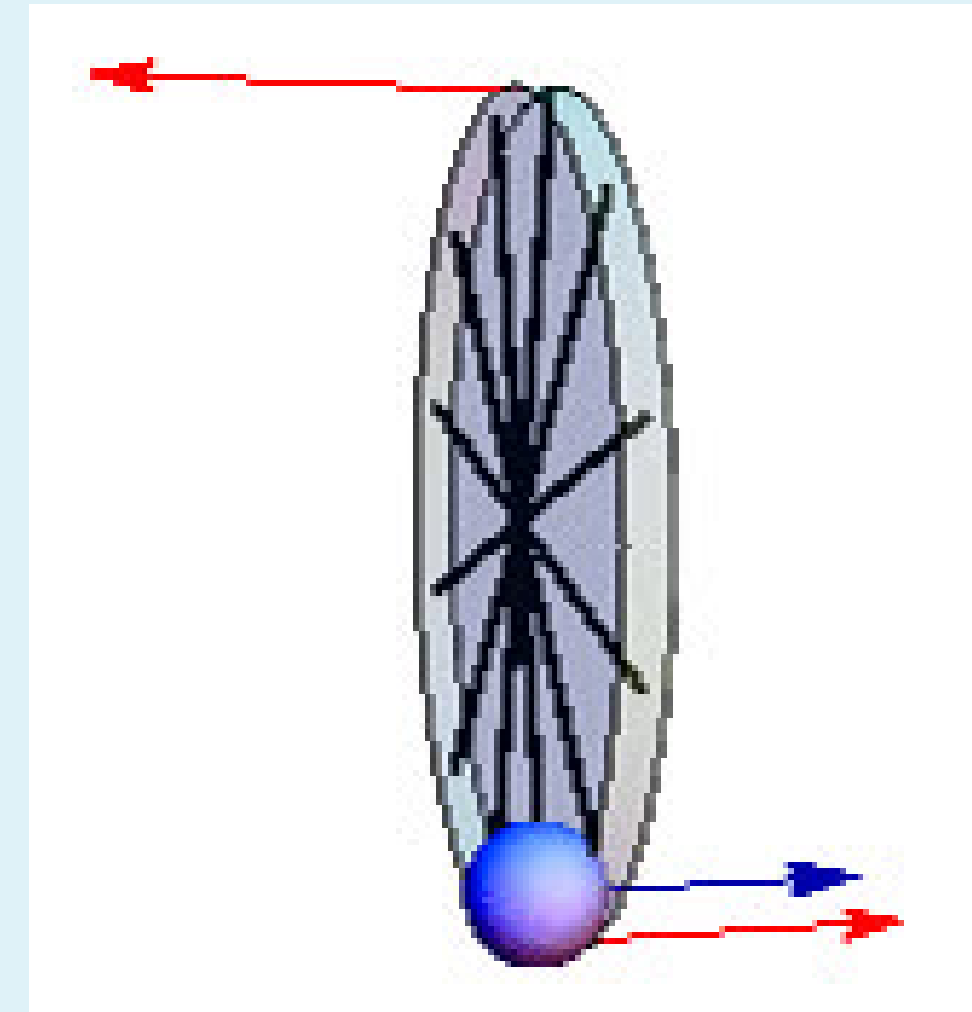
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2. Physical principle

Gyroscopic effect

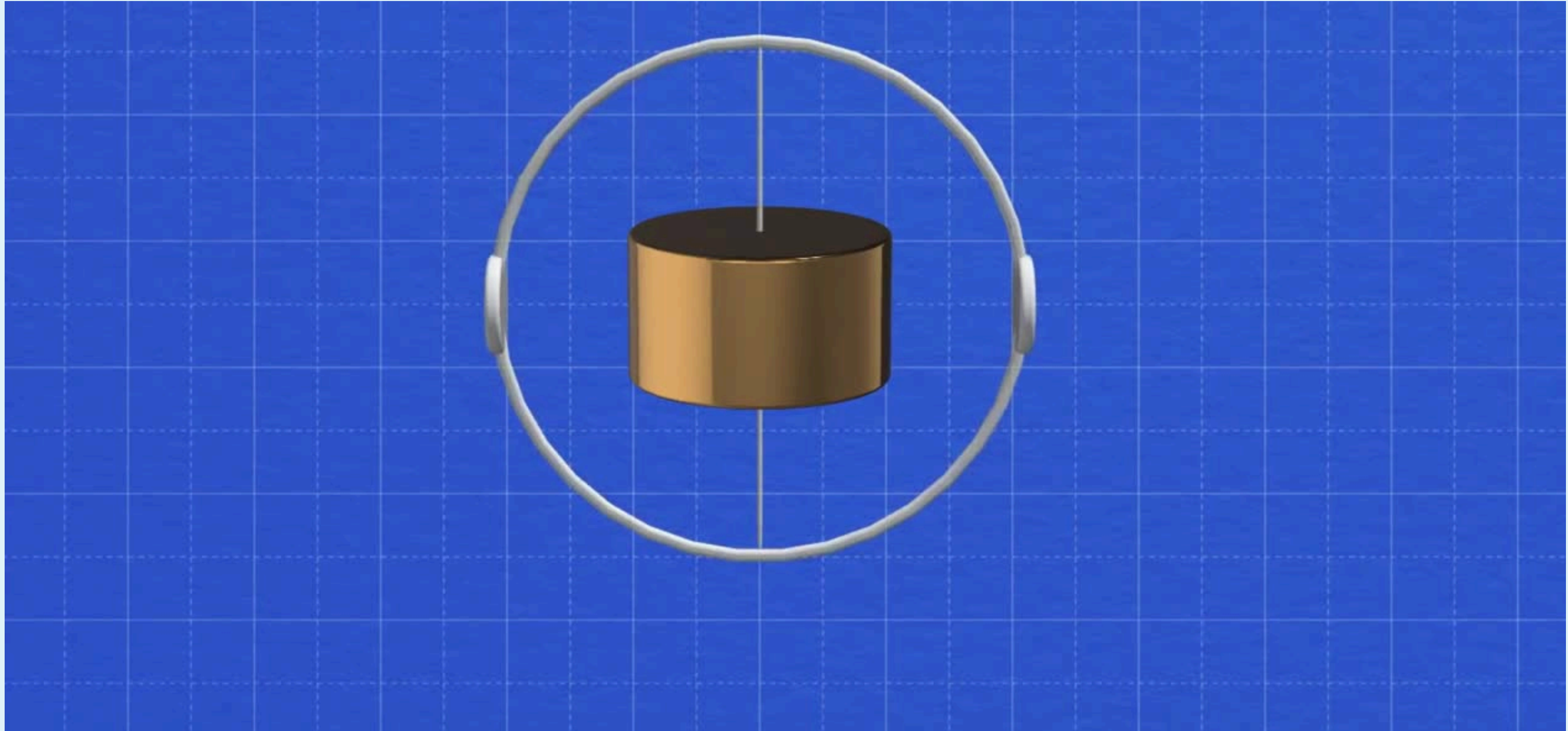
- Spinning body resists axis changes
- Conservation of angular momentum
- Torque \rightarrow precession (axis shifts 90°)
- Examples: bikes, planes, spacecraft [3]

$$\tau = \frac{dL}{dt}$$



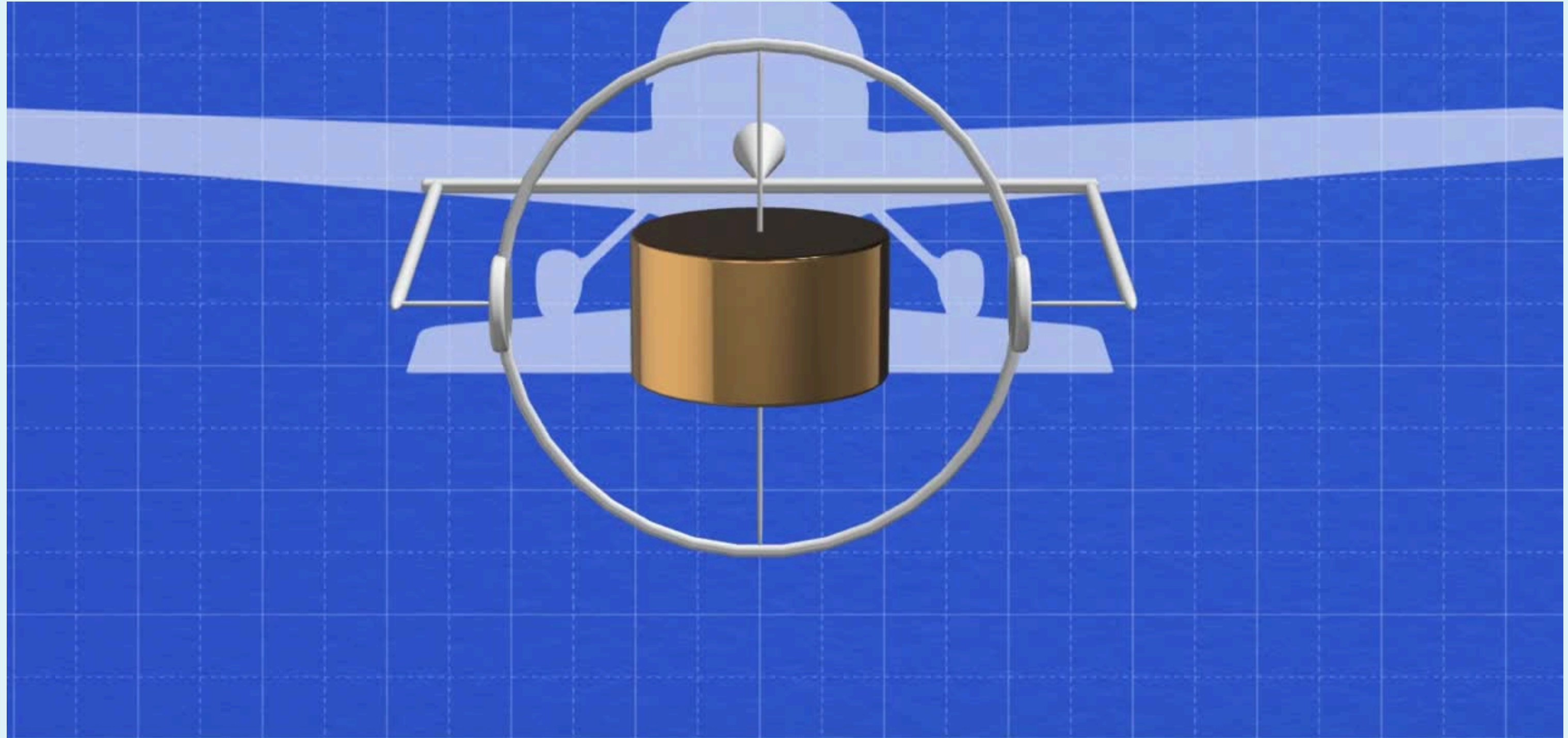
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2. Physical principle



[9]

2. Physical principle



[9]

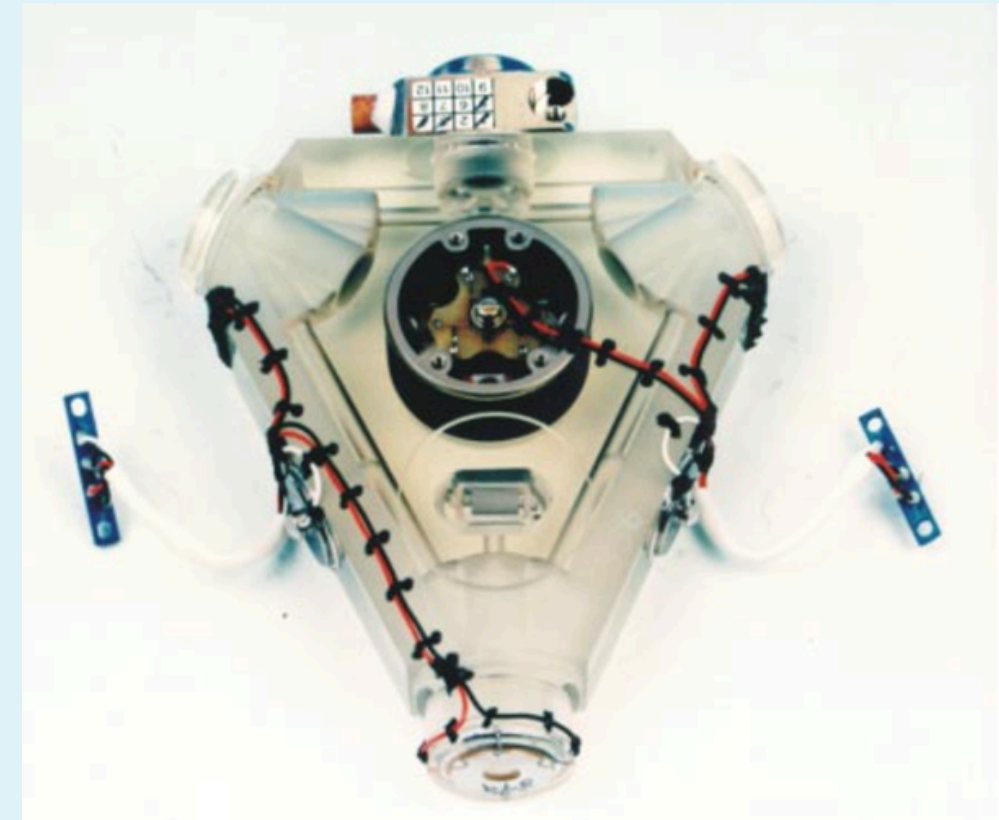
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3. Types of gyrometers

Optical Gyrometers

- Ring Laser Gyrometer : Measures rotation via interference of counter-propagating laser beams.
- Fiber Optic Gyrometer : Uses fiber optic coils to detect phase shifts caused by rotation. [10]

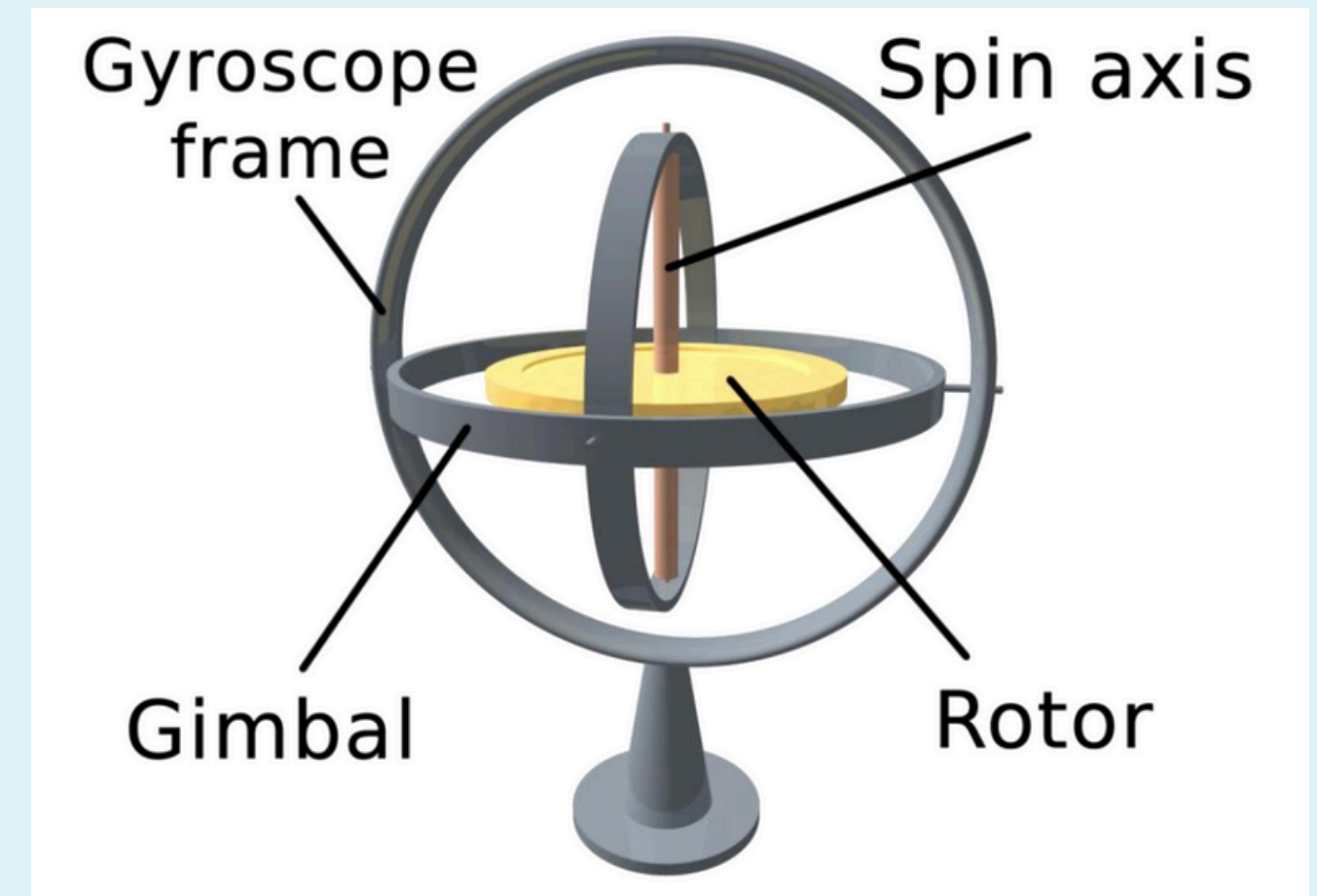


[11]

3. Types of gyrometers

Mechanical Gyrometers

- Use a spinning rotor to measure angular velocity.
- Angular momentum changes produce measurable torques proportional to rotation. [12]

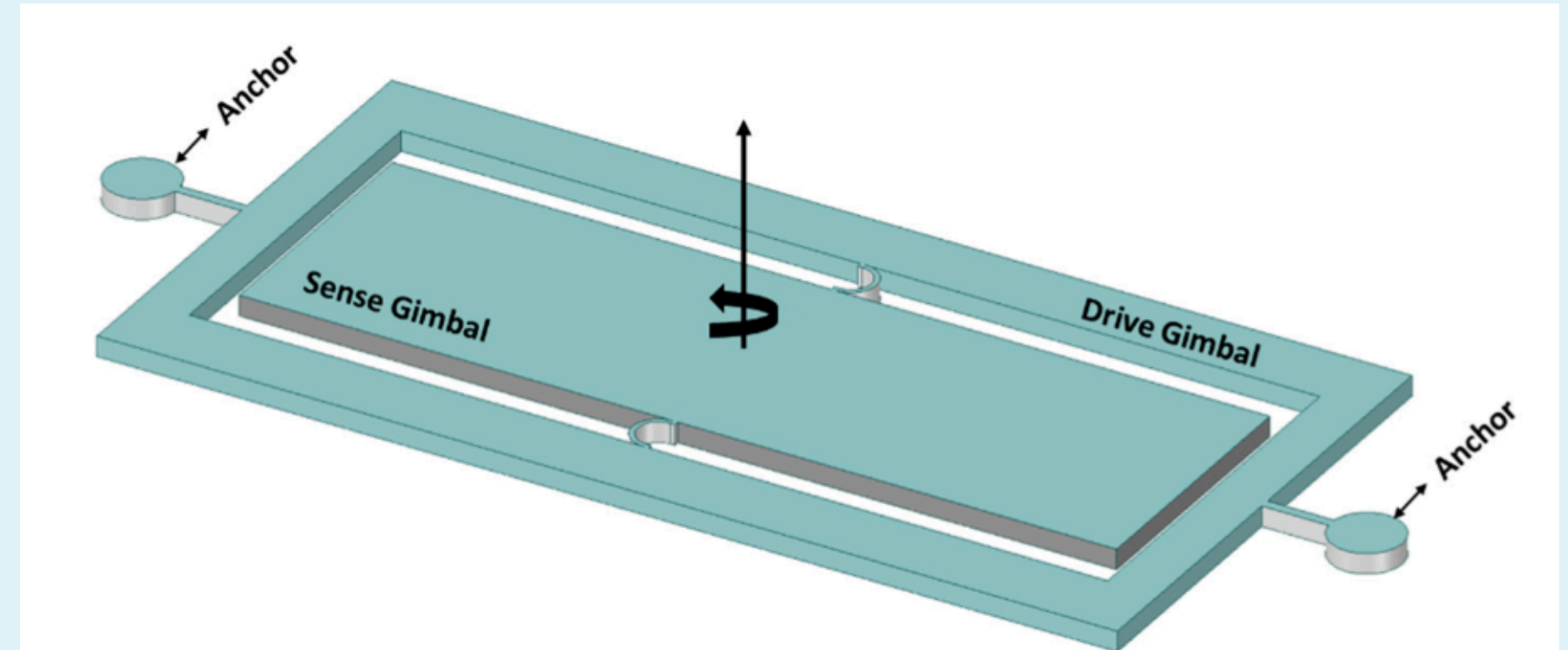


[12]

3. Types of gyrometers

Vibrating Structure Gyrometers

- Coriolis effect: Vibration shifts when rotation occurs.
- Angular velocity deduced from the induced vibration. [13]



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4. Applications

Naval applications

- To counteract the natural rocking and rolling motion of a boat.

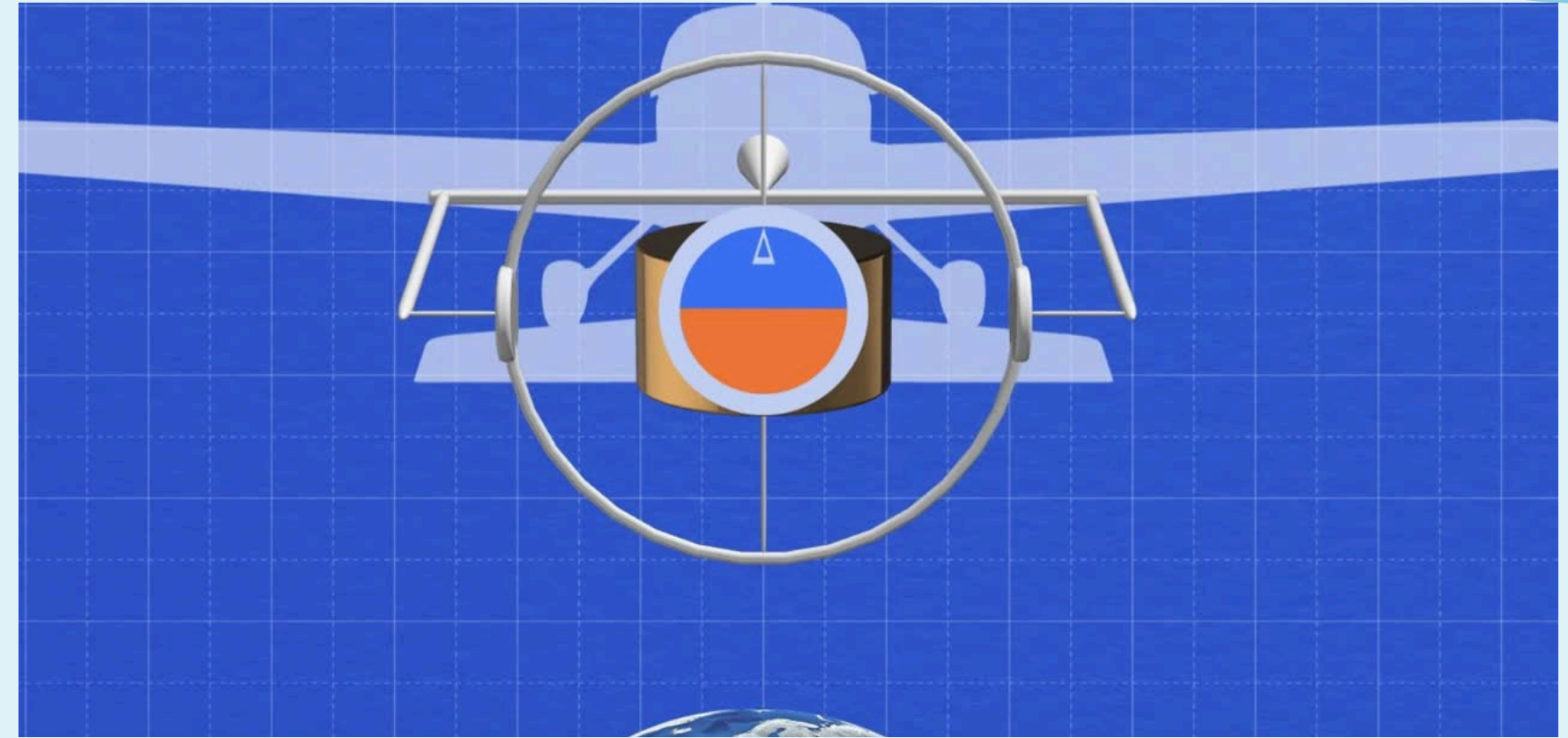


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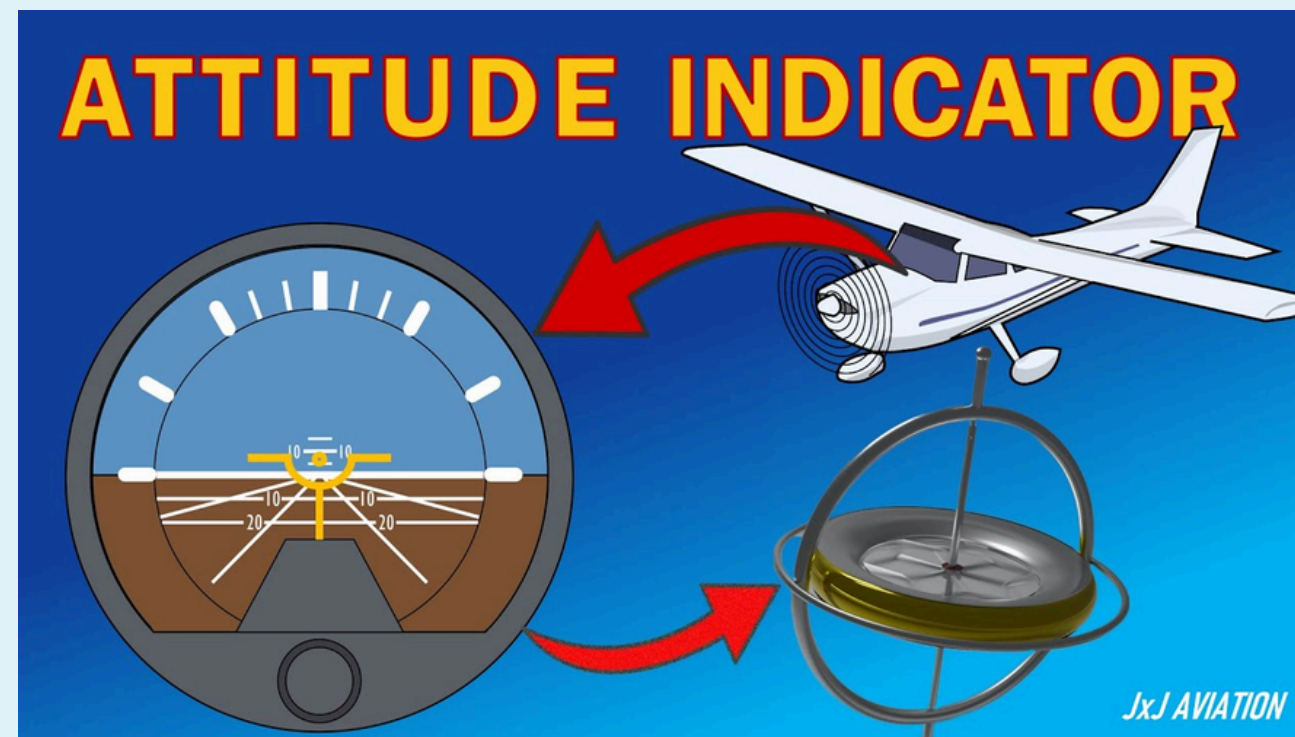
4. Applications

Aviation applications

- Essential for navigation and control



[9]



[14]

4. Applications

Robotics applications

- Drones
- Humanoid



[15]

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5. Conclusion

- Multiple applications
- Essential for stabilization and control
- Can be used in coordination with other sensors like accelerometer to obtain an IMU



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THANK YOU

ANY QUESTIONS ?