

ABSTRACT

This thesis focuses on understanding the operating principles of a gyrocompass. The research starts from the literature and computes the behaviour of a gyroscope or gyrocompass from basic mechanical principles. The results are then simulated and visualized through Excel simulations, videos and timelapses.

The basic physics fundamentals of a gyrocompass include tilt and drift on a free gyroscope, precession caused by mercury chambers and the use of a damping weight to ensure that the gyrocompass settles in the north. In practice, to minimize errors on a real gyrocompass, additional mechanisms and systems are added to the three ground principles.

The principles of tilt and drift and of controlled precession are successfully simulated and visualized; the simulation of damping is coherent for low to medium latitudes but shows deviations from the simplified formulas in the literature for high latitudes. To successfully visualize the effect of damping, a scale model of a working gyrocompass should be constructed.

Although physics principles provide a foundation, it is crucial to study the complexity of mechanical construction and calibration processes to fully understand the accuracy and functionality of a gyrocompass.