

# Multiphysics Modeling and Simulation of MEMS Based Variometer for Detecting the Vertical Speed of Aircraft in Avionics Applications

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## Abstract

The objective of this work is to develop a MEMS based Variometer to measure the vertical speed and to sense the instantaneous rate of climb or descent in Aircrafts to meet the miniaturization requirements in avionics industry. The design consists of dielectric material in between two micro electrodes. The micro diaphragm is placed on one of the electrode. As the aircraft changes altitude, the atmospheric pressure outside the aircraft changes. Air flows into or out of variometer to equalize the pressure inside the device and outside the aircraft. The deflected diaphragm inside the device is studied in order to find the change in vertical speed according to the altitude. The parameters are optimized to find the vertical speed by using Different diaphragm materials. Comparing to conventional variometer, the proposed technique improves performance and eliminates unnecessary high package cost. The materials selected for this application suitably exhibit the expected results. Changing the different materials study enhances the efficiency and accuracy of measurements. The design can also be used for gliding applications. The structure of Variometer is designed and performance is simulated using structural mechanics in COMSOL Multiphysics.