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Lift to Drag Ratio Analysis in Magnetic Levitation with an Electrodynamic Wheel[1] ANGEL GUTARRA-LEON, VINCENT CORDREY , WALERIAN MAJEWSKI, Northern Virginia Comm Coll — Our experiments explored inductive magnetic levitation (MagLev) using simple permanent magnets and conductive tracks. Our investigations used a circular Halbach array with a 1 Tesla variable magnetic field on the outer rim of the ring. Such a system is usually called an Electrodynamic Wheel (EDW). Rotating this wheel around a horizontal axis above or below a flat conducting surface should induce eddy currents in said surface through the variable magnetic flux. The eddy currents produce, in turn, their own magnetic fields, which interact with the magnets of the EDW. We constructed a four-inch diameter Electrodynamic Wheel using twelve Neodymium permanent magnets and demonstrated that the magnetic interactions produce both lift and drag forces on the EDW. These forces can be used for levitation and propulsion of the EDW to produce magnetic levitation without coils and complex control circuitry. We achieved full levitation of the non-magnetic aluminum and copper plates. Our results confirm the expected behavior of lift to drag ratio as proportional to $(L/R)\omega$, with L and R being the inductance and resistance of the track plate, and ω being the angular velocity of the magnetic flux.

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