Abstract Submitted
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Numerical analysis of the Magnus moment on a spin-stabilized projectile[1] MICHAEL CREMINS, United States Military Academy, GREGORY RODEBAUGH, Picatinny Arsenal, CLAIRE VERHULST, MICHAEL BENSON, BRET VAN POPPEL, United States Military Academy — The Magnus moment is a result of an uneven pressure distribution that occurs when an object rotates in a crossflow. Unlike the Magnus force, which is often small for spin-stabilized projectiles, the Magnus moment can have a strong detrimental effect on flight stability. According to one source, most transonic and subsonic flight instabilities are caused by the Magnus moment [Modern Exterior Ballistics, McCoy], and yet simulations often fail to accurately predict the Magnus moment in the subsonic regime. In this study, we present hybrid Reynolds Averaged Navier Stokes (RANS) and Large Eddy Simulation (LES) predictions of the Magnus moment for a spin-stabilized projectile. Velocity, pressure, and Magnus moment predictions are presented for multiple Reynolds numbers and spin rates. We also consider the effect of a sting mount, which is commonly used when conducting flow measurements in a wind tunnel or water channel. Finally, we present the initial designs for a novel Magnetic Resonance Velocimetry (MRV) experiment to measure three-dimensional flow around a spinning projectile.

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