

## ABSTRACT

A Computational Fluid Dynamic (CFD) Model and Analysis of a Bullet with  
Magnus Effect

by

Muhammad Tauhid Yusham Guntur Putra

Dr. Eng. Ressa Octavianty, Advisor

A computational study of 5.7 mm caliber bullet at was carried out using OpenFOAM version 8.0. In this study, the Reynolds number  $Re$  and Mach number  $M$  were assumed constant, that is,  $Re = 1.2 \times 10^5$  and 0.88, respectively. A rotational moment with magnitude  $\sim 3000$  rpm was defined to represent the Magnus moment during bullet's dynamics. Dynamic mesh combined with snappyHexMesh dictionaries were used in this simulation. The computational domain consists of  $\sim 250\,000$  hexahedral meshes. The Cyclic Arbitrary Mesh Interface (AMI) boundary condition was defined as the interface between the rotational and stationary regions inside. A steady-state and compressible flow were solved using *rhoPimpleFOAM* solver with  $k - \epsilon$  model to simulate the transient region in this flow. The results shows that at  $\alpha = 2$  deg, the  $C_d$  and  $C_l$  are 0.22 and 0.062, respectively.

Keyword: *Magnus effect, bullet, CFD, dynamic mesh*