

2<sup>nd</sup> International Conference on

# Fluid Dynamics & Aerodynamics

October 19-20, 2017 | Rome, Italy

## Missile-motion performance analysis of gas-steam launch system utilizing multiphase flow model and dynamic grid system

Hyun Muk Kim and Jeong Soo Kim

Pukyong National University, South Korea

A gas-steam launch is the method of ejecting a missile from a canister using gas generator rather than a propellant of the missile itself, and it has been studied in various countries. In this system, coolant is injected to the conduit and mixed with combustion gas to prevent the damage to the canister and missile caused by the hot combustion gas. The factors related to pressure build-up, such as temperature change due to an interaction of high temperature gas and coolant as well as the volume increase of a breech (Figure: 1) caused by the movement of the missile, are intertwined, making it difficult to predict the behavior of the missile ejection. In this study, thermo-fluid dynamic phenomenon in the breech was analyzed utilizing ANSYS Fluent and the motion performance of the missile was predicted. To represent the missile motion, the calculation was performed using the dynamic grid system, and DPM (Discrete Phase Model) was used to simulate a process of atomization and evaporation of liquid coolant. The realizable  $k-\epsilon$  model was employed for turbulence modeling. Parametric study was carried out by varying the coolant flow rate with the flow rate of high temperature gas fixed, to verify the 3-D DPM numerical analysis model, the simulation results were compared with those obtained from the calculation of the one-dimensional governing equations of C T Edquist, who presented a gas dynamic model to predict the gas-steam launch process of the peacekeeper ballistic missile and compared it with experimental data with a fairly good agreement.

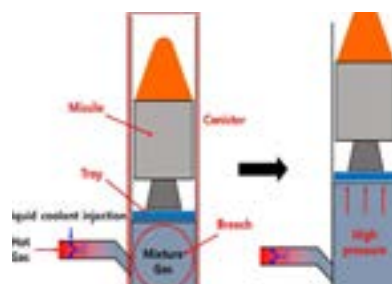


Figure 1: Scheme of canister-launched missile system.

### Biography

Hyun Muk Kim is pursuing his Master's Degree from Pukyong National University in Busan, South Korea. He belongs to the Propulsion and Combustion Laboratory. He majors in Computational Fluid Dynamics, and has been conducting research on thrust performance and combustion characteristics by modeling numerical simulation of methane-oxygen bipropellant thruster as well as on gas-steam launch system.

hmkim@pukyong.ac.kr

### Notes: