Investigation on Characteristics of PIFS (Plume Induced Flow Separation) and Wall Heat Transfer Rate at the Missile After-body

o Jae Gwan Kim, School of Mechanical and Aerospace Engineering, BD. 40-110, Seoul National University, E- mail: wind77@snu.ac.kr
Kyu Hong Kim, School of Mechanical and Aerospace Engineering and Institute of Advanced Aerospace Technology, BD. 302-628, Seoul National University, E-mail: aerocfd1@snu.ac.kr

Abstract

Numerical investigation was conducted to study the effects of after-body configurations on the PIFS (Plume Induced Flow Separation) and heat flux to the base face.

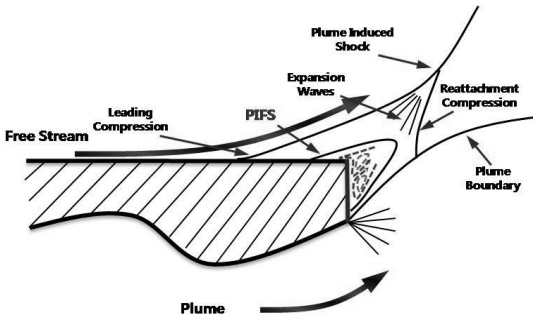

Fig.1. PIFS phenomenon

Two dimensional and axi-symmetric Navier-Stoke's solver with k-ω SST turbulence model was used to solve the missile type configuration with propulsive jet. Experimental result of PIFS conducted by Robert J. McGhee was compared with our computational results for code validation.

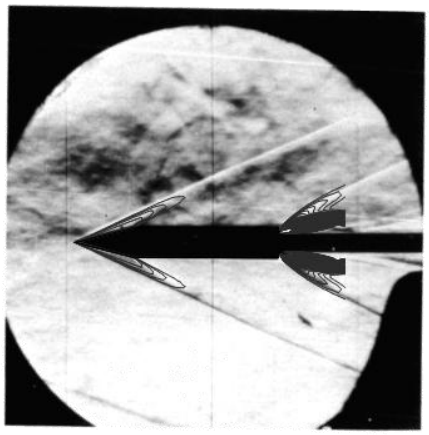

Fig.2 Density contour comparison

And three types of the after-body configurations were simulated for this study.

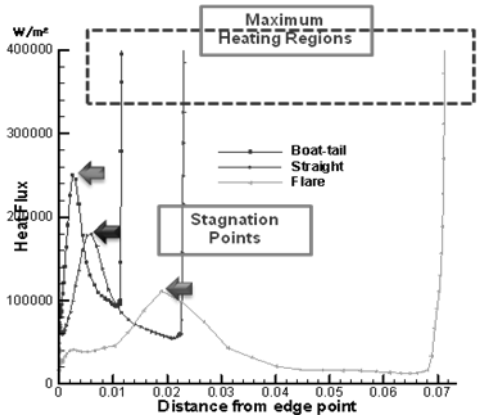

Fig.3 Heat flux along base configurations

As a result of numerical investigations, higher altitude condition and boat-tail after-body configuration caused severe PIFS phenomenon but the flare type after-body configuration suppressed PIFS. Flare type after-body configuration reduced heat flux to base face.