Numerical Simulation of Uneven Heating of Missile Surfaces Travelling at Supersonic Speed

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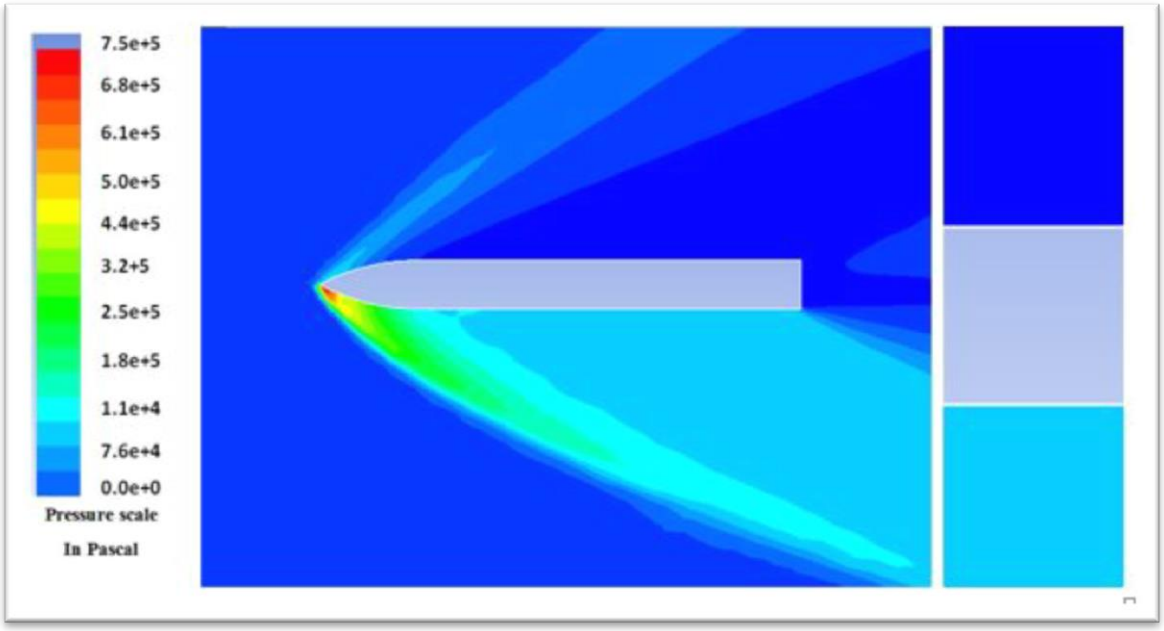

Fig: Formation of Coronal loop due to high Lorentz force

Missile's traveling at very high speed windward side face high resistance and friction due to contact between the fluid and missile structure. This high speed flow fluid particle after hitting the missile body transfer the energy in terms of heat. Missile shape and geometry selected in such way that the overall drag associated with the Missiles should be less, but in other hand skin friction associated with the body is very high. At higher Angle of attack missile front facing i.e. windward side face more friction force and heat generation that of the leeward side. Windward side friction and heat generation cause the uneven heating of the body traveling at supersonic speed. Majority the trajectory needs to be followed is dependent on streamline curvature of the body and drag force. The shape of a Missile's is generally selected on the basis of combined aerodynamic, guidance, and structural considerations. Thus the presented work gives the estimation of uneven heating of missile surface (windward side and leeward side) which many time cause for bending of missile. CFD simulation over Missile body at supersonic speed is considered and various results for 2D Missile geometry have been carried out. ANSYS-FLUENT software is taken for numerical simulation. Understanding the various flow characteristics and thermal analysis to obtain temperature distribution over body need to solve. Also skin friction and form drag are important criteria for body heating and path followed by the missile body. The lowest drag was achieved with a cone-cylinder at the considered Mach number range 1 to 5. It is also shown that the drag can be reduced by boattailing the after body. Results for Mach 3 are calculated and discuss.