Heat flux estimation on the missile base at high altitudes and supersonic speeds

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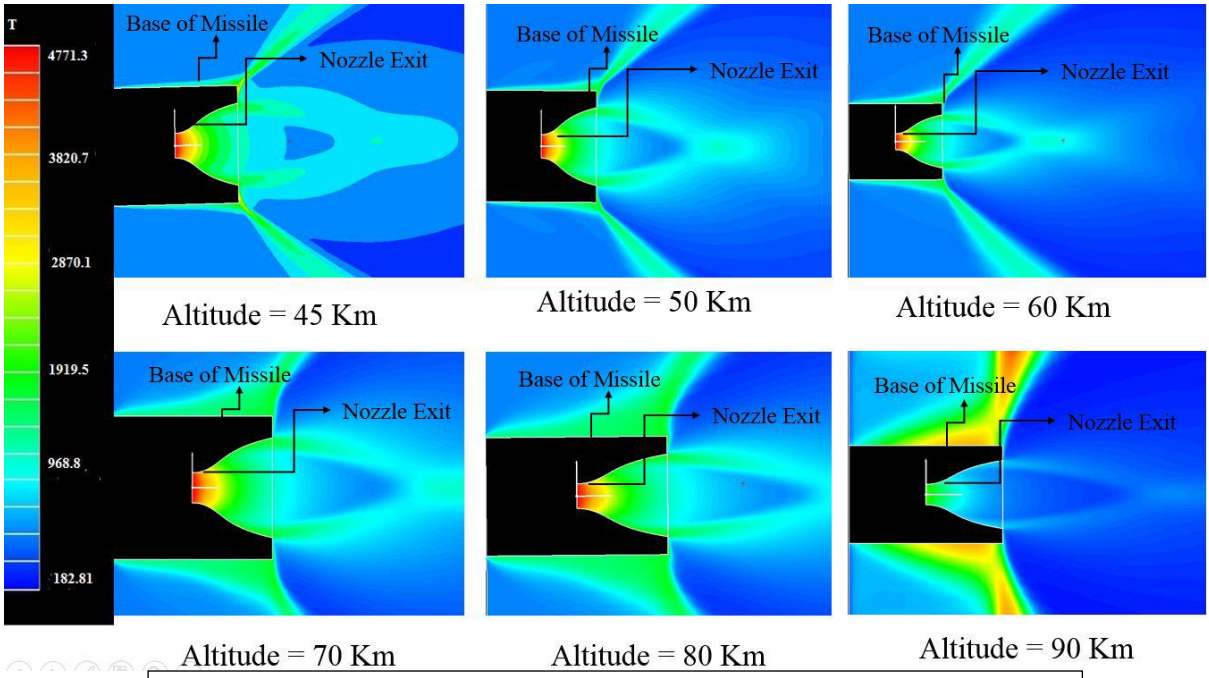

Fig: Temperature profile near the base of missile at different altitudes

For long range ballistic missiles one of the most difficulties is the trajectories or path covered by these missiles as per the required and designed parameters. Mainly the missiles lost their trajectories due to the aerodynamic heating during their re-entry into the Earth's atmosphere in which the outer surface of missile gets heated nearly in the ranges of tens of thousands of degrees Fahrenheit due to which it loses it symmetrical curvature and finally misses the target due to higher drag forces. Another major concern related to long range missiles is its disconnection with the mothership or launching station occurring due to base heating of missiles at high altitudes. This phenomenon generally occurs due to overheating of the base of the missiles at high altitudes, where the exhaust gases from the nozzles rebounds and hits back its base comprising of electrical and electronic systems. The sensors and other sophisticated electronic equipment's gets damaged resulting in the disconnection of missiles from home station and finally it get lost. This work is related to the estimation of the heat fluxes on the base of missiles at high altitudes where the atmospheric pressure is almost negligible. Heat fluxes and base temperature were estimated using Fluent, in which different parameters like high Mach number, pressure at high altitudes, and turbulent models were taken into considerations. Numerical analysis was done using ANSYS-Fluent 15.0 software, which is a powerful tool for solving problems involving fluid mechanics. This work aims to estimate the heat fluxes over the missile base, in order to implement optimized thickness of suitable coating material, which will keep the electrical equipment's well safe inside these coatings, thereby minimizing chances of getting lost due to electrical equipment's rupturing due to overheating. Results of the velocity (vectors and streamlines), pressure distribution are showed and analyzed. Approximate heat flux was estimated.