عنوان مقاله:

CFD Simulations and External Shape Optimization of Missile with Wing and Tailfin Configuration to Improve Aerodynamic Performance

محل انتشار:

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خلاصه مقاله:

The wing of missile can be considered as an effective factor for determination of lift to drag ratio. However, there are few studies that investigate wing effect on missile aerodynamics. Therefore, the purpose of this study is to indicate wing effect on the missile aerodynamics and optimize wing geometry for enhancement of aerodynamic efficiency. The missile designed tail-fin configuration is selected from a previous study which contains experimental data. In the beginning of study, Computational Fluid Dynamics (CFD) simulations of selected missile are performed and compared with experimental data. Wing is then mounted to the selected missile and CFD solution is repeated for modified missile at $6°$ angle of attach (AoA) and subsonic and supersonic speeds. The modified missile shows good performance in point of aerodynamics when compared with baseline missile model. In addition, wing geometry is optimized to improve aerodynamic performance using Multi-Objective Genetic Algorithm (MOGA). Objective functions are determined as lift and drag coefficients. Wing geometry parameters are determined as design variables for optimization. After the optimization process, the results are showed that the aerodynamic coefficients are improved when compared with baseline geometry. In addition, response surface analysis is presented to show which design parameters are more effective on drag and lift forces. The findings of study show that optimum results are more efficient in terms of performance. CFD solution method and the optimization procedure can be applied to design or optimize for different geometry.

کلمات کلیدی:

Missile aerodynamics, Genetic Algorithm, Multi-objective optimization

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