

Computational Fluid Dynamic Simulation (CFD) and Experimental Study on Wing-external Store Aerodynamic Interference of a Subsonic Fighter Aircraft

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ABSTRACT

The main objective of the present work is to study the effect of an external store to a subsonic fighter aircraft. Generally most modern fighter aircraft is designed with an external store installation. In this project a subsonic fighter aircraft model has been manufactured using a computer numerical control machine for the purpose of studying the effect of the external store aerodynamic interference on the flow around the aircraft wing. A computational fluid dynamic (CFD) and wind tunnel testing experiments have been carried out to ensure the aerodynamic characteristic of the model then certified the aircraft will not facing any difficulties in stability and controllability. In the CFD experiment, commercial CFD code is used to simulate the interference and aerodynamic characteristics of the model. Subsequently, the model together with an external store was tested in a low speed wind tunnel with test section sized 0.45 m×0.45 m. Result in the two-dimensional pressure distribution obtained by both experiments are comparable. There is only 12% deviation in pressure distribution found in wind tunnel testing compared to the result predicted by the CFD. The result shows that the effect of the external storage is only significant at the lower surface of the wing and almost negligible at the upper surface of the wing. Aerodynamic interference is due to the external storage were mostly evidence on a lower surface of the wing and almost negligible on the upper surface at low angle of attack. In addition, the area of influence on the wing surface by store interference increased as the airspeed increase.