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Extension of the FVM method to subsonic speeds

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Abstract

An engineering level method, the free vortex model (FVM) method, which was developed for supersonic flow has been extended to subsonic incompressible Mach numbers. The method was applied to predict lee side flow features for a tangent ogive missile with very low aspect ratio wings in the '+' orientation. Simulations were carried out for three different span to body diameter ratios, namely 1.25, 1.50 and 1.75. Prediction results were validated by comparing aerodynamic loads and vortex positions to validated CFD data as well as another established engineering method namely the discrete vortex model (DVM) method. The normal force was well predicted while the centre-of-pressure position predictions were reasonable. The vortex positions were not predicted with the acceptable level of accuracy and is therefore a limitation of the method at incompressible speeds. It was shown that the FVM method is less suitable for span to body diameter ratios above 1.25 for which the DVM method is more suitable.