

SELECTED TOPICS In Aerospace Engineering

EDITOR

ERWIN SULAEMAN



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INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

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IMPROVED VORTEX LATTICE METHOD

26.1. Introduction

This chapter describes overview of dynamics of air vehicle with additional considerations on the flexibility of the vehicle structure. The consideration on the structural flexibility is important on the vehicle design due to escalating demand on optimizing the vehicle performance by increasing the vehicle speed and in the same time by decreasing structural stiffness to reduce the weight. These two optimization procedures will lead to a higher structural deformation which, at one point, induces additional loading that should be properly taken into account. The focus of the following 11 chapters is to investigate the effect of the structural flexibility on the air vehicle stability and response, with the emphasis on the structural stiffness formulation, aerodynamic load induced by structural deformation, and interaction between aerodynamic load and structural dynamic force that leads to instability problem.

26.2. Present Vortex Lattice Method

In this section, the integration of the steady part of the kernel function is evaluated. It has been known that an integration of the doublet line of the kernel is difficult to evaluate directly, even for steady case. The integration has been accomplished by Jordan only for a rectangular wing in an incompressible flow [35]. On the other hand, an integration of a similar vortex distribution using a steady horseshoe vortex, the well-known vortex lattice method (VLM), has been successfully