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Study of Numerical Analysis Method for Transonic Wing Flutter

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Introduction

Flutter is a self-excited vibration phenomenon which is one of the aeroelastic phenomena and occurs by a mutual interaction of aerodynamic force, inertial force, and elastic Usually, structural oscillation is damped by force. aerodynamic force but catastrophic oscillation occurs at a certain flutter speed. In the worst case, it brings about wing destruction instantly. Thus it can be said that wing flutter is a very dangerous phenomenon. And it has a feature called transonic dip which lead to sudden a decline of flutter boundary in Transonic region. This feature is important factor to analyze flutter phenomenon.



Past Accidents

- Control surface flutter (World War I) \rightarrow Handley Page O/400 bomber (1916, UK)

Handley Page O/400 bomber

Recent Flutter Researches

- Increase in demand of experiment and numerical analysis for flutter in association with using composite materials

exp ——

Euler 🔶

0.6 - RANS ----

Need for more accurate CFD method



 \succ Grid convergence decreases when the shock wave exist on the wing surface Computational results show higher boundary than experimental results

computational cost while retaining capability of capturing transonic dip phenomenon \succ Full potential equation + boundary layer equation

•Keep certain accuracy and reduce computational cost