

## COMPUTATIONAL STUDIES OF AEROELASTICITY OF AIRCRAFT ENGINE TURBINE BLADE

Marcel ILIE<sup>1</sup>, Augustin SEMENESCU<sup>2</sup>

**Rezumat.** Modul tranzitoriu al sarcinii aerodinamice a unei palete de turbină a unui motor de avion reduce timpul de viață al paletei și, ca urmare, timpul de viață al motorului. De aceea, o estimare corectă a sarcinii aerodinamice și un model cuplat al aerodinamicii și structurii poate crește timpul de viață al paletei turbinei și a motorului, prin reducerea timpilor de întreținere. Această cercetare investighează instabilitatea vibrațiilor paletei de turbine a unui motor de avion, în condiții de instabilitate aerodinamică. Ecuatiile Navier-Stokes împreună cu modelul SST-kω pentru turbulentă sunt rezolvate pe cale numerică. Studiul arată faptul că vibrațiile produc variații temporale ale coeficienților aerodinamici.

**Abstract.** Transient blade loading limits the lifetime of aircraft engine turbine blades. Thus, accurate prediction of the unsteady aerodynamic loading and coupled fluid-structure interactions would improve the life the lifetime of the turbine blades. This study investigates the flutter instability of an axial turbine blade under unsteady aerodynamic loading. The viscous Navier-Stokes equations with the SST- $k\omega$  turbulence model are employed. The results show that the flutter phenomenon causes unsteady oscillations of the aerodynamic coefficients lift and drag.

**Keywords:** Cross-flow jet, Blowing-ratio, Vortex ring, Large-Eddy Simulation

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### 1. Introduction

Aeroelasticity is an important and critical phenomenon encounter in many aerospace applications such as airplane wing, compressor/turbine blades, helicopter blades, etc. In gas turbine engine, the aeroelasticity is a major concern due to the fact that it decreases the engine performance and poses critical issues. The flutter phenomenon causes fatigue failure of the blade and therefore, it poses

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<sup>1</sup>PhD, Assistant Professor: Dept. of Mechanical Engineering, Georgia Southern University, Statesboro, GA 30458, USA. E-mail: [milie@georgiasouthern.edu](mailto:milie@georgiasouthern.edu)

<sup>2</sup>PhD, Professor, Dept. of Material Sciences, University Politehnica Bucharest, Bucharest, Romania; Associate Member of Academy of Romanian Scientists. E-mail: [augustin.semenescu@upb.ro](mailto:augustin.semenescu@upb.ro)

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