

제트엔진용 복합재료 Fan Vane의 초음속 유체유발 진동해석 Flow-Induced Vibration Analysis for Supersonic Composite Jet-Engine Fan Vane

김동현[†].오세원^{*}.김유성^{*}(경상대학교).김경희^{**}(삼성테크윈)

Dong-Hyun Kim, Se-Won Oh, Yu-Sung Kim, and Kyung-Heui Kim

Key Words : Jet-Engine Fan Vane(제트엔진용 Fan Vane), Coupled-Time Integration(연계시간적분), Flow-Induced Vibration(유체유발 진동), Dynamic Moving Grid(동적이동격자), Composite(복합재료)

Abstract : In this study, a fluid-induced vibration (FIV) analysis system has been developed in order to investigate the nonlinear dynamic aeroelastic phenomenon for supersonic composite jet-engine fan vane system. The moving fan derives the flow from the inflow to stationary vane row. Due to the high rotation speed of fan and high inflow speed, vane rows can inherently face with shock wave phenomenon. Also strong nonlinear dynamic instability such as flutter can appear in fan vane system. In this paper, relative movement of the fan with respect to vane is reflected by modeling independent two computational domains. Calculation grid system is modeled using the unstructured grid with dynamic moving and local deforming methods. The Newmark direct integration method, fully implicit time marching scheme, is used to compute the fluid-structure interaction problem. Unsteady, Reynolds-averaged Navier-Stokes equations are solved for unsteady flow problems using Spalart-Allmaras turbulence models. Detailed FIV responses for steel and composite material vanes with respect to time and vibration characteristics are investigated in the time domain.