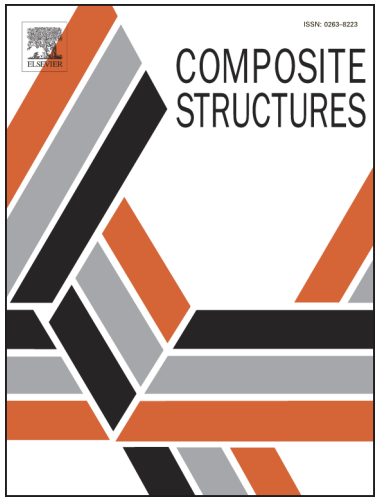

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PII: S0263-8223(17)30423-3
DOI: http://dx.doi.org/10.1016/j.compstruct.2017.04.016
Reference: COST 8447

To appear in: *Composite Structures*

Please cite this article as: Wang, X., Morandini, M., Masarati, P., Velocity feedback damping of piezo-actuated wings, *Composite Structures* (2017), doi: http://dx.doi.org/10.1016/j.compstruct.2017.04.016

Velocity feedback damping of piezo-actuated wings

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Abstract

A geometrical nonlinear model of thin-walled beams with fiber-reinforced and piezo-composite is developed for smart aircraft wing structures. Some non-classical effects such as warping inhibition and three-dimensional (3-D) strain are accounted for in the beam model. The governing equations and the corresponding boundary conditions are derived using the Hamilton's principle. The Extended Galerkin's Method is used for the numerical study. A negative velocity feedback control algorithm is adopted to control the aircraft wing response. The effective damping performance is optimized by studying anisotropic characteristics of piezo-composite and elastic tailoring of the fiber-reinforced host structure. The relations between active vibration control effect and design factors, such as the size and position of piezo-actuator are investigated in detailed.

Keywords: thin-walled beam, fiber-reinforced, piezo-composite, active control

Nomenclature

a_{ij}	1-D global stiffness coefficients
$\mathcal{A}_i^F$	Piezo-actuator coefficients, see Appendix A
b_{ij}	Inertial coefficients
$2b$, $2d$	Width and depth of the beam cross-section, see Fig. 1
$B_w, \tilde{B}_w, \bar{B}_w$	Pure mechanical bimoment, piezo-bimoment actuation, and

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