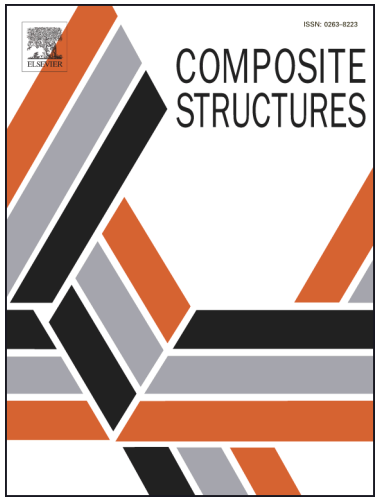

The study on the morphing composite propeller for marine vehicle. Part I: Design and numerical analysis

Fanlong Chen, Liwu Liu, Xin Lan, Qinyu Li, Jinsong Leng, Yanju Liu

PII: S0263-8223(16)31964-X
DOI: http://dx.doi.org/10.1016/j.compstruct.2017.02.072
Reference: COST 8294

To appear in: *Composite Structures*

Received Date: 25 September 2016
Revised Date: 25 January 2017
Accepted Date: 13 February 2017

Please cite this article as: Chen, F., Liu, L., Lan, X., Li, Q., Leng, J., Liu, Y., The study on the morphing composite propeller for marine vehicle. Part I: Design and numerical analysis, *Composite Structures* (2017), doi: http://dx.doi.org/10.1016/j.compstruct.2017.02.072

The study on the morphing composite propeller for marine vehicle. Part I: Design and numerical analysis

Fanlong Chen[1,#], Liwu Liu[1,#], Xin Lan[2], Qinyu Li [1], Jinsong Leng[2], Yanju Liu[1,*]

[1]Department of Astronautical Science and Mechanics, Harbin Institute of Technology, Harbin 150001, People's Republic of China

[2]Centre for Composite Materials and Structures, Harbin Institute of Technology, Harbin, 150080, People's Republic of China

*Corresponding authors: yj_liu@hit.edu.cn

#These authors contributed equally to this work.

Abstract: This paper details a novel morphing composite propeller (MCP) to improve the performance for marine vehicles (MVs). A MCP is designed with an active rotatable flap (ARF) to change the blade's local camber with flap rotation. A piezo-stack actuator has been connected with one transmission mechanism housed in the propeller blade to push the ARF to obtain various configuration of the MCP. A commercial Finite Element (FE) software ANSYS Fluent was employed to analyse and simulate the hydrodynamics around the propeller with the ARF ranging from -5° to +5° and the advance speeds ranging from 1.08 to 2.52 m/s. Finally, the FE results has been used to predict improved performances of the MCP and found the morphing composite propeller configuration has improved the efficiency by 1.1% while improving the structural durability.

Keywords: smart structure, morphing composite propeller, marine vehicles, transmission mechanism, hydrodynamic analysis, structure responses.