

Accepted Manuscript

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PII: S1359-835X(17)30219-1
DOI: <http://dx.doi.org/10.1016/j.compositesa.2017.05.029>
Reference: JCOMA 4681

To appear in: *Composites: Part A*

Received Date: 24 January 2017
Revised Date: 20 May 2017
Accepted Date: 24 May 2017

Please cite this article as: Sun, F., Wang, P., Li, W., Fan, H., Fang, D., Effects of circular cutouts on mechanical behaviors of carbon fiber reinforced lattice-core sandwich cylinder, *Composites: Part A* (2017), doi: <http://dx.doi.org/10.1016/j.compositesa.2017.05.029>

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Effects of circular cutouts on mechanical behaviors of carbon fiber reinforced lattice-core sandwich cylinder

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Abstract: Experiments were carried out to reveal cutout effects on stress concentrations, failure styles, natural frequencies and mode shapes of conical carbon fiber reinforced composite (CFRC) lattice-core sandwich cylinder (LSC). The LSC exhibits ductile failure induced by skin fractures initiating from the cutout and propagating circumferentially. In the test, the strains concentrate at the cutouts. This is consistent with the initiation of the cracks. Free vibration test reveals the cutout cylinder has identical vibration mode with ordinary cylinder, but the higher order modes are more complex. Numerical simulations were performed to supplement more information of the cutout effects. The cutout has little influence to the free vibration performances. The stress distribution differs from uniform laminated shells. Cutout has obvious effect to the stress concentration factor (SCF), which reaches to 7 for the skin. Appropriate strengthening can reduce the SCF by 40%.

Keywords: A. Sandwich structures; B. Mechanical properties; B. Stress concentrations.

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