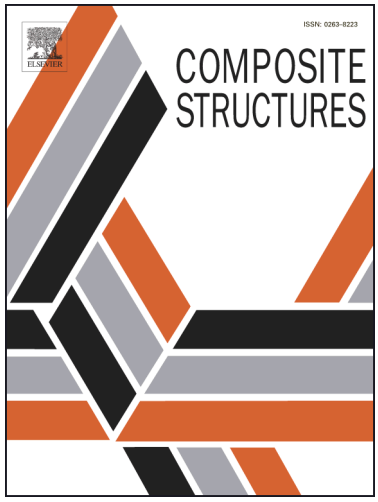

Finite element analysis of low-velocity impact response of convex and concave composite laminated shells

Ik Hyeon Choi

PII: S0263-8223(17)33066-0
DOI: https://doi.org/10.1016/j.compstruct.2017.11.090
Reference: COST 9156

To appear in: *Composite Structures*

Received Date: 19 September 2017
Revised Date: 6 November 2017
Accepted Date: 30 November 2017

Please cite this article as: Choi, I.H., Finite element analysis of low-velocity impact response of convex and concave composite laminated shells, *Composite Structures* (2017), doi: https://doi.org/10.1016/j.compstruct.2017.11.090

Finite element analysis of low-velocity impact response of convex and concave composite laminated shells

Ik Hyeon Choi

Aerospace Application & Materials Research Team, Korea Aerospace Research Institute, South Korea

Abstract

The transient response of composite laminated cylindrical shells with convex and concave shapes, subjected to low-velocity impact, was numerically investigated. Geometrically linear analysis without consideration of the membrane effect demonstrated the same contact force and central deflection histories for convex and concave shells. This unexpected numerical result could be explained by the detailed investigation of all stiffness matrix terms of the finite element equation. Furthermore, in the geometrically linear analysis, the dynamic strain distribution on the top surface of the convex shell exhibited the same contour shapes as those on the bottom surface of the concave shell, with the exception of only a reversed value between the tensile and compressive strains. This unique numerical result could also be explained by the detailed investigation of each term of the strain-displacement relation. Finally, we can conclude that geometrically nonlinear analysis must be performed with consideration of the membrane effect of the curved shell, in order to accurately analyse its impact response.

Keywords: membrane effect, geometrically nonlinear analysis, cylindrical shell, convex, concave, low-velocity impact

E-mail address: ihchoi@kari.re.kr