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Multi-failure analysis of composite Isogrid stiffened cylinders

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Abstract: Adopting filament winding and co-curing technique, carbon fiber reinforced composite (CFRC) Isogrid stiffened cylinders (ISCs) were designed and manufactured. Revealed by experiments, CFRC ISC has multi-failure modes, including material failure, global instability, local buckling, rib crippling and end delamination. Failure criteria for the first four failure modes were proposed and applied to predict the failure load of specific ISC. Skin thickness, cell dimension, rib height, rib thickness and end strengthening scheme jointly decide the failure pattern and failure load of the ISC. Failure maps were deduced to figure out the optimizing route for lightweight design of ISC. Wrapped ends were suggested to restrict the end delamination failure mode which results in rather low and uncertain load carrying capacity.

Keywords: B. Mechanical properties; C. Analytical modelling; D. Failure; E. Filament winding.

1 Introduction

Lightweight, strong and stiff carbon fiber reinforced composite (CFRC) Isogrid stiffened cylinders (ISCs) have been applied in aerospace Engineering [1, 2].

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