Progressive Failure Analysis of Laminated Composite Structures

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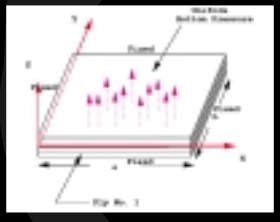
Composite materials are extensively used in maritime structures.

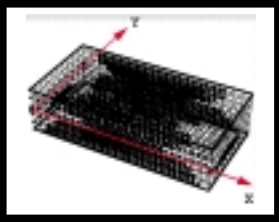
But the concept of progressive damage of laminated composites requires thousands of load steps for a safe and reliable assessment of their strength at collapse.



The Laminate Boundary Value Problem

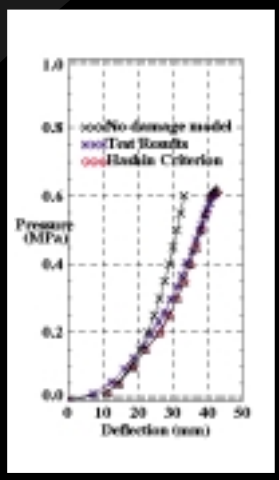
Matrix Cracks at 0.10 MPa and fibre Breakage at Final Failure. Aspect Ratio 1

Matrix Crack at 0.10 MPa and fibre Matrix Shear at Final Failure. Aspect Ratio 2.5



Matrix Crack at 0.10 MPa and fibre Matrix Shear at Final Failure. Aspect Ratio 2

The progressive damage model includes all the well established strength theories for failure detection.It predicts the load deformation behaviour better than that of the no-damage model.



Load Central Deflection Graph. Aspect Ratio 1

However, about 40000 load steps are needed to satisfy equilibrium at each damaged material point, which requires CPU time of the order of days. Therefore the use of sequential programs becomes inadequate for such an analysis. The use of a parallel FE program ABAQUS on an IBM SP2
is currently being investigated

CEDC correspondence to
cedc@soton.ac.uk
or Prof. A.J. Keane,
Department of
Mechanical Engineering,
University of Southampton,
Highfield, Southampton,
SO17 1BJ, U.K.,
Tel +44-1703-592944
FAX +44-1703-593220.

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University of Southampton