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Realistic approaches to boundary conditions and load path evaluation in predicting modes of structural failure in airframe components

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In the design of airframes, aerospace engineers are tasked with designing members and connections to handle loads that have been either calculated from large mathematical models or obtained from testing. These loads are often isolated and handled discretely when analysing and designing structural members and connections. The results are often overly conservative or result in non conservative predictions in stress or safe life calculations. Field data obtained from numerous fixed and rotary-wing aircraft have shown that initial predictions of structural failure can be grossly incorrect. Furthermore, subsequent investigations have shown that simplified analyses based on discrete loads and simplified boundary conditions are a major cause of non conservative predictions. More realistic models can be generated by stress analysts using nonstandard composite boundary conditions that account for complexities in load path redistribution without requiring unreasonably large models or significantly increased computational time. Though the initial resource investment is greater for such models, if done correctly, the end result yields a more accurate prediction of strength or safe life, as well as a more efficiently designed structural component. The general approach of composite boundary conditions for load path evaluation is discussed herein along with several examples.

Biography

Dave Hodges received a bachelor in aerospace engineering from Georgia Institute of Technology in 1999. In 2002, he was hired onto the Georgia Tech Research Institute (GTRI) research faculty to aid in the investigation of structural problems on the H-60 Black Hawk helicopter. After leaving GTRI in 2010, he became a freelance consultant in the field of aerospace, structural, and mechanical engineering. He is a licensed Professional Engineer and currently works for Phoenix Engineering and Consulting, Inc. in Woodstock, Georgia providing complex stress analyses and consulting for tension structures, challenge courses, industrial structures and machinery, rigging grids, drilling equipment, and atypical product designs.

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