

Deformed Shape Calculation of a Full-Scale Wing Using Fiber Optic Strain Data from a Ground Loads Test



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DEFORMED SHAPE CALCULATION OF A FULL-SCALE WING USING FIBER OPTIC STRAIN DATA FROM A GROUND LOADS TEST

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Bibliogov, United States, 2013. Paperback. Book Condition: New. 246 x 189 mm. Language: English . Brand New Book ***** Print on Demand *****.A ground loads test of a full-scale wing (175-ft span) was conducted using a fiber optic strain-sensing system to obtain distributed surface strain data. These data were input into previously developed deformed shape equations to calculate the wing's bending and twist deformation. A photogrammetry system measured actual shape deformation. The wing deflections reached 100 percent of the positive design limit load (equivalent to 3 g) and 97 percent of the negative design limit load (equivalent to -1 g). The calculated wing bending results were in excellent agreement with the actual bending; tip deflections were within +/- 2.7 in. (out of 155-in. max deflection) for 91 percent of the load steps. Experimental testing revealed valuable opportunities for improving the deformed shape equations robustness to real world (not perfect) strain data, which previous analytical testing did not detect. These improvements, which include filtering methods developed in this work, minimize errors due to numerical anomalies discovered in the remaining 9 percent of the load steps. As a result, all load steps attained +/- 2.7 in. accuracy. Wing twist results were very sensitive to errors in bending and require further development. A sensitivity analysis and recommendations for fiber implementation practices, along with, effective filtering methods are included.



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