Inspection and Characterization of Advanced Structures and Materials

Dr. Arthur R. Johnson
Army Research Laboratory
Hampton, VA

Cadet Daniel M. Asis
United States Military Academy
West Point, NY

ABSTRACT:

Fabric air beam supported structures are used extensively within both the civilian and military sectors. Their primary advantages include that they are characteristically light and logistically simpler. The various design considerations that affect fabric air beam performance are air pressure, fabric material, and beam diameter. These different parameters ultimately determine the point at which air beams fail due to wrinkling. To model this behavior, the University of Maine created a MATLAB software package that allowed users to create loading scenarios and observe the resulting four point beam deflection. Their software entailed a somewhat gradual learning curve but effectively incorporated air beam wrinkling; however, further refinement is needed in characterizing the air beams. ARL's Vehicle Technology Directorate produced an ABAQUS Software package that modeled air beam performance as supports in tents. Still in its initial phases, the software was limited to a parallel configuration. Nonetheless, the package entailed a steep learning curve and visually expressed the loading configurations utilizing a shell model.

KEYWORDS: fabric air beam, prestress, air beam wrinkling

CONTACT: Dr. Arthur R. Johnson, Army Research Laboratory, Durability, Damage Tolerance & Reliability Branch, NASA Langley Research Center, Hampton, VA, Tel: (757) 864 – 1310, Email: Arthur.R.Johnson@NASA.GOV

CDT Daniel M. Asis, United States Military Academy, West Point, NY, Tel: (845) 515 – 1277, Email: Daniel.Asis@usma.edu