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PRELIMINARY ANALYSIS OF THE TENSILE FATIGUE PROPERTIES OF KEVLAR/EPOXY TUBULAR BRAIDED COMPOSITES UNDER VARIABLE MANUFACTURING AND TESTING PARAMETERS

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ABSTRACT

The goal of this pilot study is to evaluate the low-cycle and high-cycle fatigue life of Kevlar-epoxy tubular braided composite (TBC) structures. TBC specimens will be fabricated with one of two internal diameters (7/16" or 3/8") using either 18 or 36 total fiber yarns oriented at one of three possible braid angles (35°, 45°, or 55°). For each, a stress magnitude will be identified beyond which the structure will cease to be useful in practical load-bearing applications due to fiber fracture or localized collapse in the fiber architecture. Specimens will be cyclically loaded to 80%, 60%, and 40% of this stress until they experience one of these two phenomena, with the results used to construct S-N curve data. During fatigue loading, the surface temperature of specimens will also be monitored through thermal imaging. Fatigue testing will be conducted at frequencies of 10 Hz and 1 Hz. Together, these results will reveal how dynamic loading rates or alterations to the yarn preform geometry influence the buildup of thermal energy within TBCs under fatigue loads, and how strongly this affects their resultant fatigue life.

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