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MATERIALS AND STRUCTURES SYMPOSIUM (C2)
New Materials and Structural Concepts (4)

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COMPUTATIONAL MODELING OF TEMPERATURE DISTRIBUTION IN A NEWLY DEVELOPED ENCAPSULATED AND BRAIDED ANNEALED GRAPHITE EPOXY COMPOSITE RADIATOR IN A SPACECRAFT

Abstract

A vital part of space vehicle design is the thermal control subsystem. An important issue in the design of the thermal control subsystem is the localized concentration of heat dissipation; high dissipating electronic devices have a very high heat density over a small footprint area to the radiator panel. The design of large spacecraft structures constructed with more than one material must give careful attention to the mechanical loads introduced by the thermal growth resulting from dissimilar coefficient of thermal expansion CTEs; hence there is a great need for structural compatibility between the doublers and the spacecraft bus radiator which is not the case with embedded aluminum heat pipe. Higher thermally conductive polymer composites are currently been used as sink to dissipate the heat produced by such electronic components. Therefore alternative advanced thermal materials are needed to meet future spacecraft thermal radiator requirements to ensure compatibility with doublers or can even be used without doublers. This paper seeks to computationally model the Temperature distribution in a newly developed encapsulated and braided annealed graphite epoxy composite radiator to determine its thermal and structural performance. A simulation and test programme will be initiated to verify the ability of this new material concept to meet performance requirements in an operational environment which includes significant thermal cycles and vibration levels representative of launch loads.