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MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

Author: Dr. Gabriel Sznejer
Rafael Advanced Defense Systems Ltd., Israel

USE OF COMPOSITE MATERIALS BASED ON CYANATE ESTER RESINS FOR MANUFACTURE OF SPACE QUALIFIED STRUCTURES WITH HIGH DIMENTIONAL STABILITY

Abstract

Rafael's Composite Materials group has been involved in the Israeli space program since its beginning in the late 80's. This group produces structures for most projects of the space program specializing in design, fabrication and testing of lightweight aerospace structural assemblies.

The design of these structures involves analysis for extreme conditions including: natural frequencies; dynamic environments, vibration and shock; temperature effects such as soaking and different temperature patterns; moisture release effects; gravity effects and acoustic effects.

The composite structures are manufactured using a wide range of composite material technologies. The materials used are based on prepregs with carbon fibers and cyanate ester resins. This unique material, together with different production technologies, ensure the performance of these structures under space specs, such as low out-gassing, low coefficient of thermal expansion and low coefficient of moisture expansion.

To ensure the structures' performance a large number of tests are performed. All the components are tested using NDT methods, both ultrasonic and X-ray. Bonding validation samples and mechanical properties validation specimens are tested in the mechanical laboratory and the full structures, after assembling, are tested in the structural strength laboratory.

The properties of the prepreg, with an emphasis on the properties of the cyanate ester resin, that enable design and manufacture of a high dimensional stability structure, will be showed. The requirements for a space structure will be described and several space qualified structures will be presented.