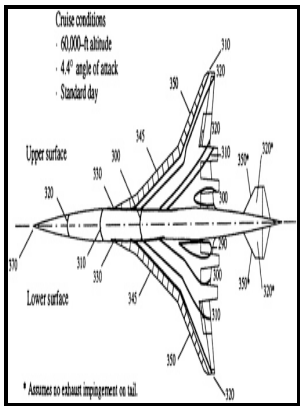
Effect of thermal stresses on the integrity of three built-up aircraft structures

Dryden Flight Research Center - Thermal Expansion Cracks in Brick Walls & Foundations



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Notes: Bibliographical references: p.15-17.
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Vassilis KOSTOPOULOS

Doyle 1969a, b also showed that while tensile properties of Hiduminium-RR58 were increased by cold work after quenching, the creep resistance was reduced.

Thermal Residual Stress

In addition to the residual stresses produced via processing, heat treatment, and straining in the monolithic materials, the introduction of reinforcements with different coefficients of thermal expansion than the matrix alloy induces additional thermal residual stresses as well as the possibility of increased mechanical residual stresses because the reinforcements do not deform in a plastically deforming matrix Bourke et al. There are exceptions, notably when the surfaces have been shot peened, cold burnished or heat-treated to produce compressive residual stresses at the surface. Cracks extending beyond the vent tube flange would allow a direct path to the wing fuel tank and result in a fuel leak.

4 Degradation Mechanisms

Potential aircraft applications envisioned for hybrid laminates include lower wing skins, fuselage skins, tear straps, and empennage structures.

Aircraft load (Part I)

The effects of hygrothermal exposures on matrix morphology must be considered when determining acceptable performance.

Elliptical and circular bonded composite repair under mechanical and thermal loading in aircraft structures

The majority of the research in this area is being conducted by the Boeing Commercial Airplane Group under the Advanced Technology Composite Aircraft Structure ATCAS program as part of NASA's ACT initiative. In addition to many theoretical treatments of the effects of applied stress on precipitate growth and coarsening, there are experimental observations of particular relevance Weatherly and Nicholson, 1968; Singer and Blum, 1977. Principal thermal stresses were studied from the standpoint of uniaxial stress assumptions.

Numerical Method for Fatigue Life of Aircraft Lugs Under Thermal Stress

Interacting shape optimisation of continuum structures. The response of WC-based cemented carbides to applied uniaxial compression and tension has been extensively studied.

The Effect of Electrochemical Machining on the Fatigue Strength of Heat Resistance Alloys in: Fatigue of Aircraft Structures Volume 2011 Issue 3 (2011)

Installation of the mechanically fastened repair would have been time-consuming since the upper wing skin must be removed to permit access to the required fasteners in the lower wing skin. The resulting specimens were grouped into two categories depending on the level of the initial fibre prestrain case A low, case B high.

Residual stress

Several investigations have shown that the high-cycle unnotched fatigue lives of aluminium alloys can be longer in vacuo than in air.

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