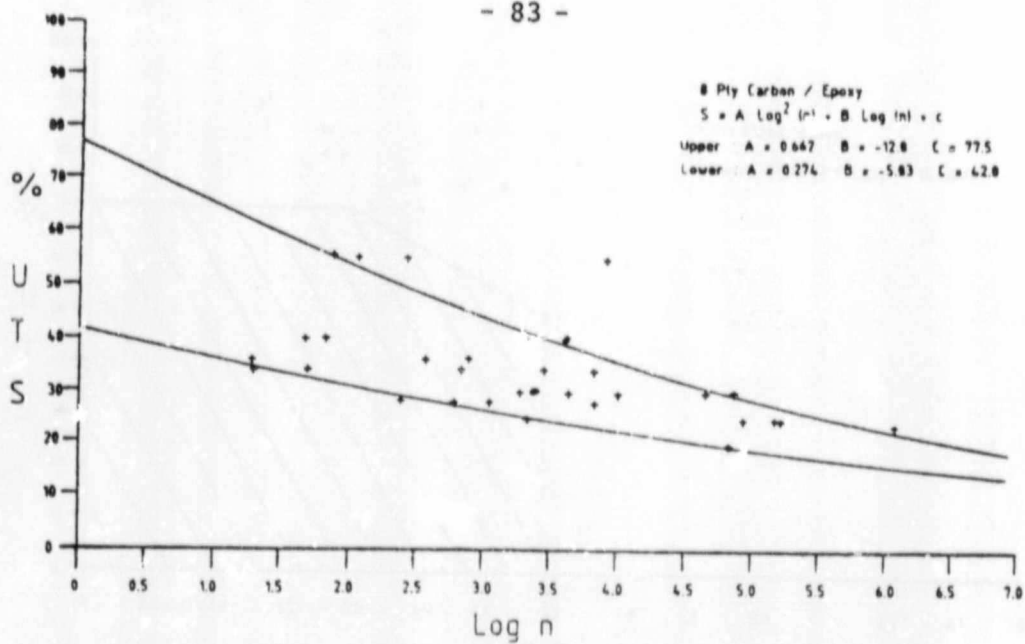
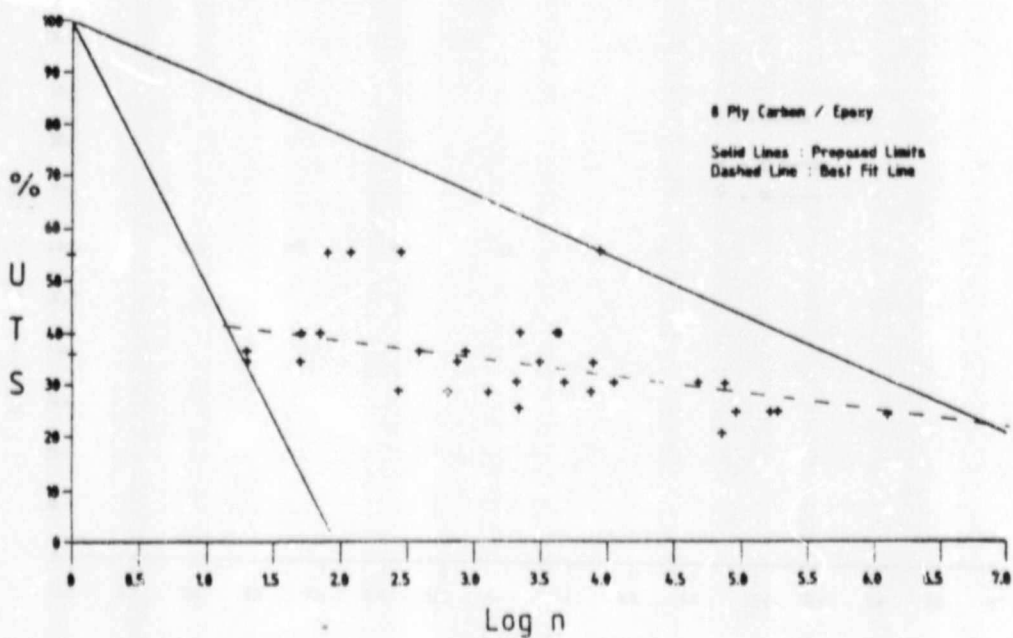
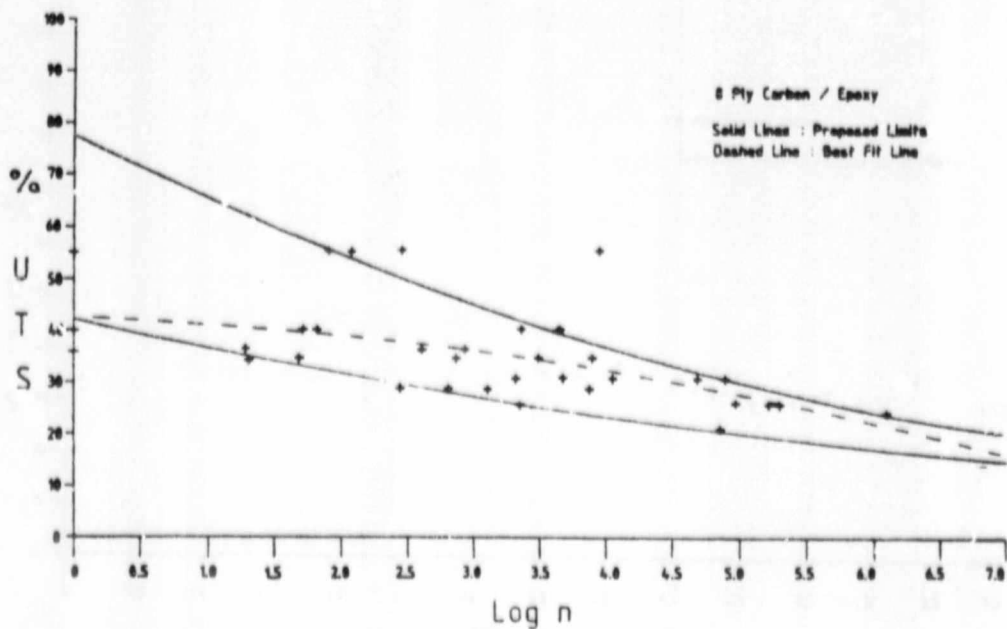




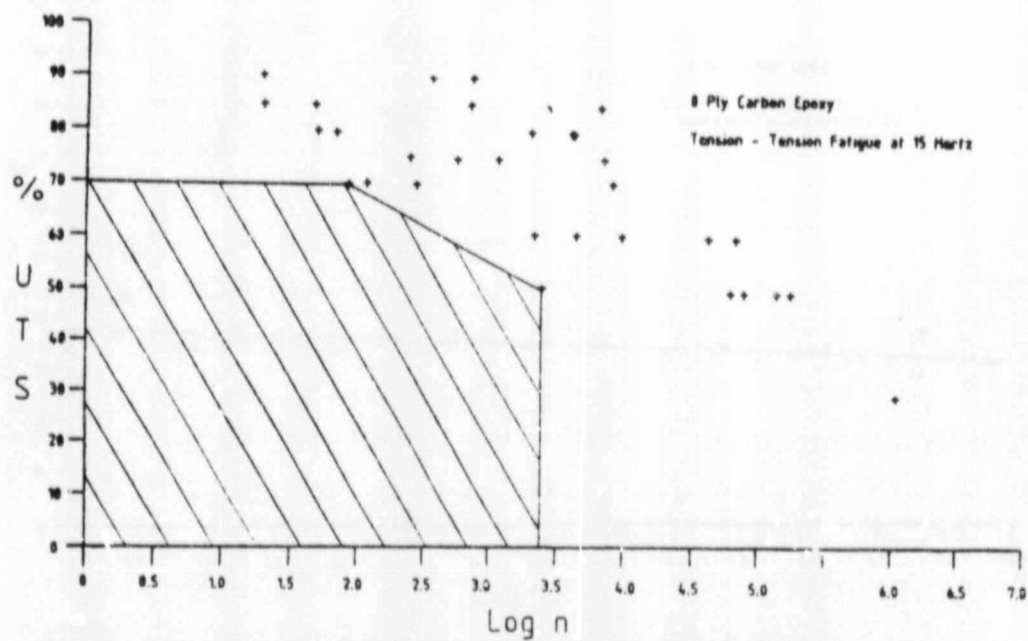
Graph 10 : Parabolic Limits w.r.t. UTS



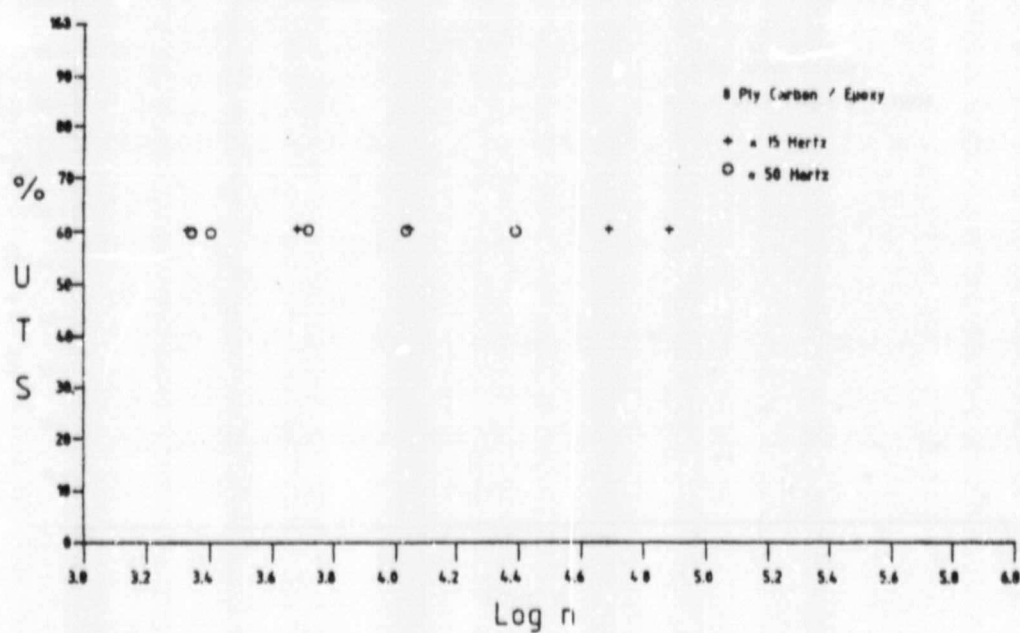
Graph 11 : Linear Comparison w.r.t. UTS



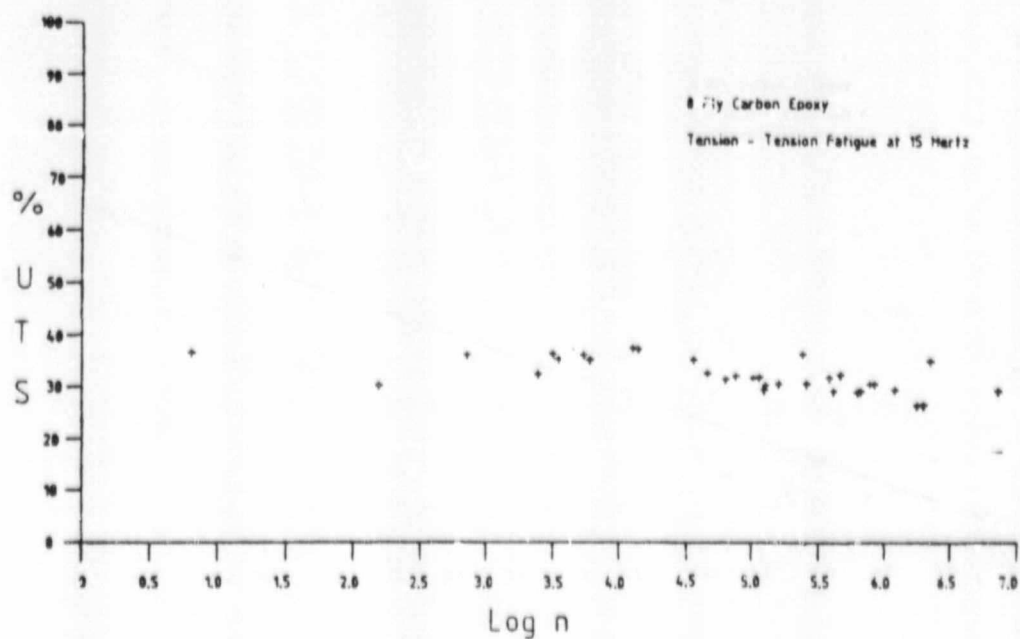
Graph 12 : Parabolic Comparison w.r.t. UTS



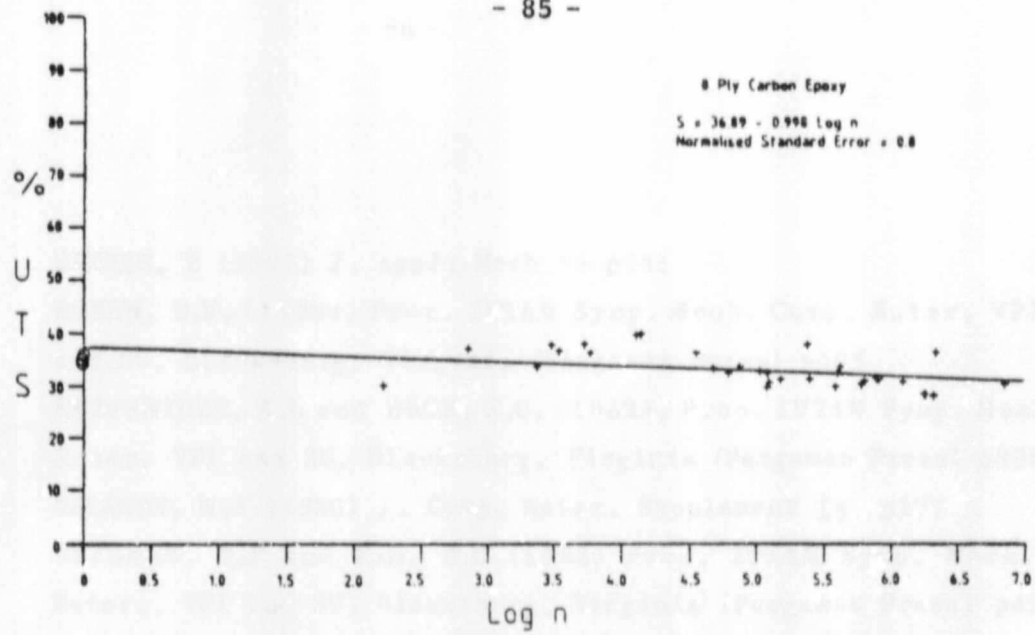
Graph 13 : Safe Fatigue Area Down to S = 50 %



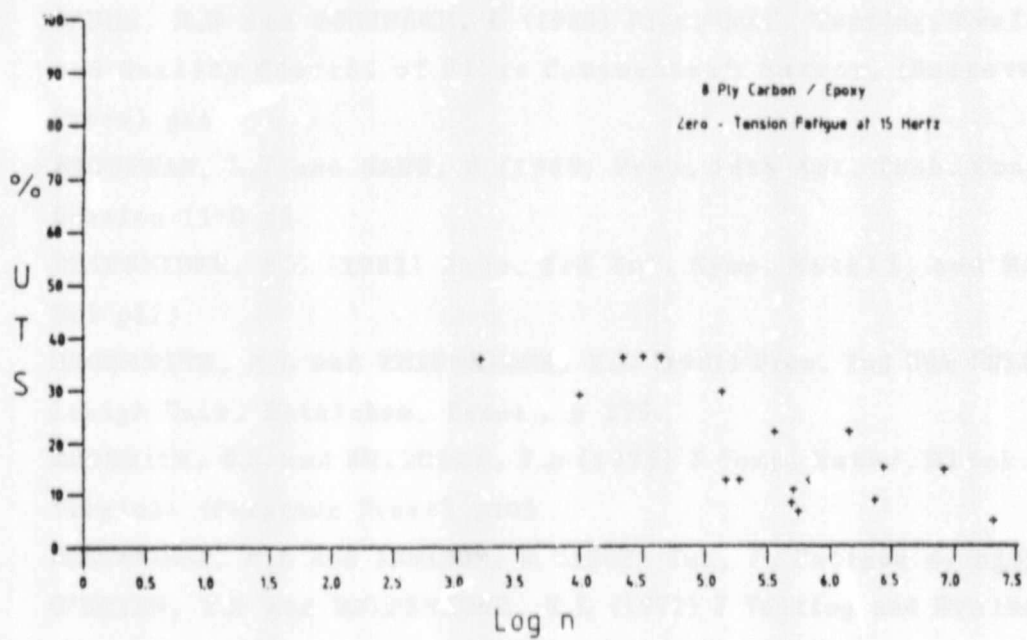
Graph 14 : Frequency Dependence



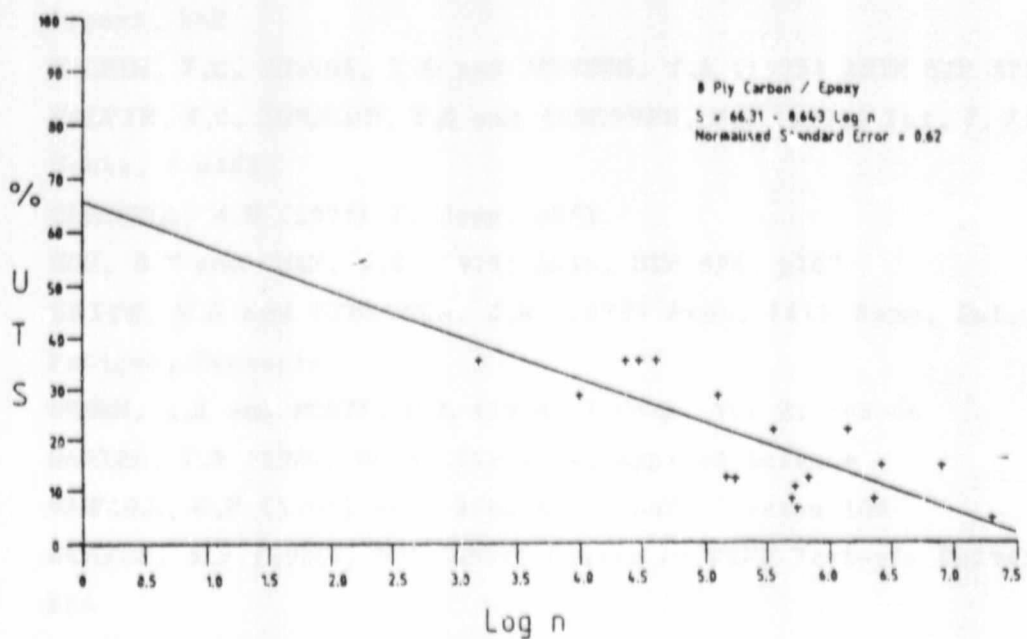
Graph 15 : Test Results (Log - Linear Axes)



Graph 16 : Linear Fit Through Experimental Data



Graph 17 : Test Results for Unnotched Specimens



Graph 18 : Linear Fit for Unnotched Specimens

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GLOSSARY

Definitions and Descriptions

- 1 Fatigue the process of progressive localised permanent structural change occurring in a material subjected to conditions that produce fluctuating stresses and strains at some point or points and that may culminate in cracks or complete fracture after a sufficient number of fluctuations.

* The term fatigue in the materials testing field, has, in at least one case, glass technology, been used for static tests of considerable duration, a type of test generally designated as stress-rupture.

- 2 Nominal stress S - the stress at a point calculated on the net cross section by simple elastic theory without taking into account the effect on stress produced by geometric discontinuities such as holes, grooves, fillets, etc. S (KN/mm²) or (KN/m²).

- 3 Maximum stress, S_{max} - the stress having the highest algebraic value in the stress cycle, tensile stress considered positive and compressive stress negative.

- 4 Minimum stress, S_{min} - the stress having the lowest algebraic value in the cycle.

- 5 Stress ratio, A or R - the algebraic ratio of two specified stress values in a stress cycle.

Two commonly used stress ratios are : the ratio of the stress amplitude to the mean stress, that is, $A = S_a / S_w$ and the ratio of the minimum stress to the maximum stress, that is, $R = S_{min}/S_{max}$.

- 6 Fatigue life, N , - the number of cycles of stress or strain of specified character that a given specimen sustains before failure of a specified nature occurs.

- 7 Fatigue failure - fatigue failure may usually be said to occur when a specimen has completely fractured into two parts. When fibrous materials, large specimens, residual stresses, etc, cause a large number of cycles to elapse from formation of microscopic cracks to

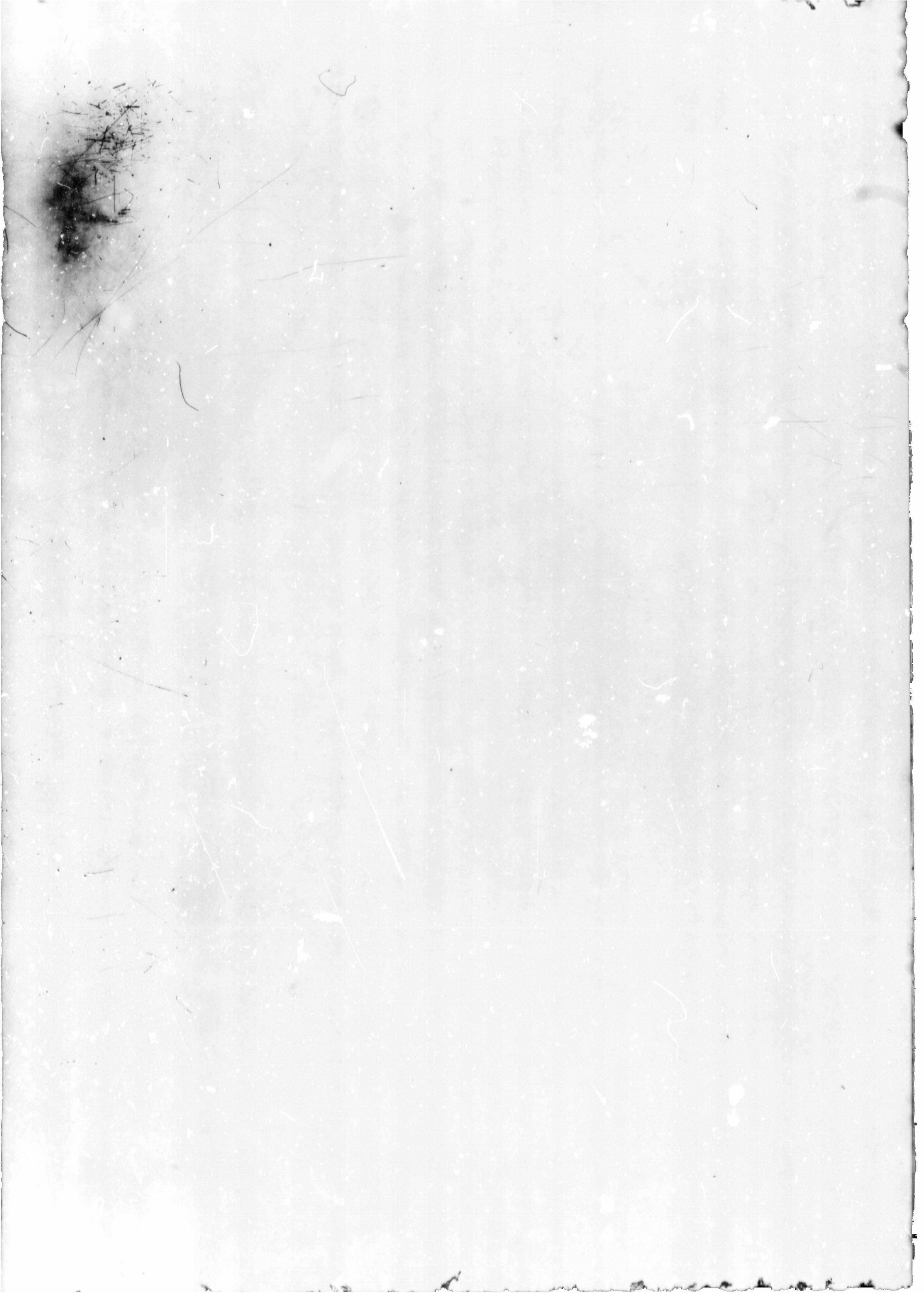
complete fracture, fatigue failure is arbitrarily defined as having occurred when the stiffness of the specimen has been reduced by a specified amount as a result of the cracks.

- 3 Fatigue strength at N cycles S_N - a hypothetical value of stress for failure at exactly N cycles, determined from an S-N diagram. The value of S_N thus determined is subject to the same conditions as those which apply to S-N diagram.
- 9 Fatigue limit, S_1 - the limiting value of S_N as N becomes very large.
- 10 Theoretical stress or stress concentration factor - K_t the ratio of the greatest stress or strain in the region of a notch or other stress concentrator as determined by the theory of elasticity (or by experimental procedures that give equivalent values) to the corresponding nominal stress.
- 11 S - N diagram - a plot of S_{max} , S_{min} , against the number of cycles to failure for a specified value of S, A or R and for a specified probability of survival.
For N a log scale is almost always used.
For S a linear scale is used most often, but a log scale is sometimes used.
- 12 Epoxy - A thermosetting material widely used for casting, laminating, potting and as an adhesive.
- 13 Lamination - is the process of building up successive layers of a substance; in this case, a reinforcement material.
- 14 Matrix - A material in which something is embedded; in our case, the resin which surrounds our reinforcement fibres, strands or materials.
- 15 Advanced Composite - material of high strength and modulus especially for applications requiring high strength and low weight eg Aeronautics and Astronautics.
- 16 Carbon fibre - is made of Graphite fibres and has excellent stiffness, tensile and compressive strengths.

- 17 Unidirectionals come in two basic styles μ warp (0°) or weft (90°). They are well known for their high strength properties.
- 18 Pre-preg - is the generic term for reinforcing material that has been mechanically pre-impregnated with catalyzed resin.
- 19 Adherent - A body held together to another body by an adhesive.
- 20 Batch - A measured mix of various materials.
- 21 Curing time - The length of time a part is subjected to heat or pressure, or both, to cure the resin.
- 22 Delamination - physical separation of bond between laminate plies.
- 23 Fibre matrix interface - The region separating the fibre and matrix phases, which differs from them, chemically, physically and mechanically.
- 24 Flexural modulus - the ratio, within the elastic limit, of the applied stress and test specimen in flexure to the corresponding strain in the outermost fibres of the specimen.
- 25 Carbon volume percent - The product of the specific gravity of a laminate and the percent carbon by weight divided by the specific gravity of the glass.
- 26 Interlaminar shear strength - The maximum shear stress existing between layers of a laminated material.
- 27 Internal stress - Stress created within an adhesive layer by the movement of the adherents at differential rates or by the contraction or expansion of the adhesive layer.
- Laminate ply - One layer of a product which is evolved by bonding together two or more layers of materials.
- 29 Notch sensitivity - The extent to which the sensitivity of a material to fracture is increased by the presence of a surface inhomogeneity

such as a notch, a sudden change in section, a crack or a scratch. Low notch sensitivity is usually associated with ductile materials and high notch sensitivity with brittle materials.

- 30 Starved area - An area in a plastic part which has insufficient amounts of resin to wet out the reinforcement completely.
- 31 Static fatigue - Failure of a part under continued static load.
- 32 Stress crack - External or internal cracks in a plastic caused by tensile stresses less than that of its short-time mechanical strength. The stresses that cause cracking may be present internally or externally or may be combinations of these stresses.
- 33 Surface treatment - A material applied to fibrous carbon during the forming operation or in subsequent process.
- 34 Tack - Stickiness of an adhesive material.
- 35 Thermoset - A plastic which changes into a substantially infusible and insoluble material when it is cured by application of heat or by chemical means.
- 36 Voids - Gaseous pockets trapped and cured into a laminate.
- 37 Working life - The period of time during which a liquid resin or adhesive, after mixing with catalyst, solvent or other compounding ingredients remains useable.





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