Accidental Damage (AD), which is characterized by the occurrence of a random discrete event which may reduce the inherent level of residual strength. Sources of such damage include ground and cargo handling equipment, foreign objects, ~~erosion from rain~~, hail, lightning, runway debris, **discrete** spillage **events**, ~~freezing, thawing~~, etc., and those resulting from human error during aircraft manufacture, operation or maintenance that are not included in other damage sources.

The same sources of accidental damage as those considered for metallic materials are to be considered for non-metallic material such as composites. ~~The sensitivity to certain AD sources may differ, e.g. monolithic composites may be less sensitive to spillage, but more sensitive to heat damage~~. The consequence of damage may not be readily apparent and may include internal damage, e.g., disbonding or delamination.

Large size accidental damage, such as that caused by engine disintegration, bird strike or major collision with ground equipment, will be readily detectable and no maintenance task assessment is required.

~~b.~~

Environmental Deterioration (ED), which is characterized by structural deterioration as a result of a ~~chemical~~ interaction with its climate or environment. Assessments are required to cover corrosion, including stress corrosion, and deterioration of non-metallic materials. Corrosion may or may not be time/usage dependent. For example, deterioration resulting from a breakdown in surface protection is more probable as the calendar age increases; ~~conversely, corrosion due to galley spillage is a randomly occurring discrete event~~ **Conversely, corrosion due to**

rare events, like battery acid spillage, should be assessed as a randomly occurring discrete event.

~~. Frequently occurring fluid spillage, like galley spillage, that occur several times during typical inspection intervals should be taken into account when assessing the operational environment~~. ~~Conversely, corrosion due to rare events, like battery acid spillage, should be assessed as a randomly occurring discrete event.~~

~~Stress corrosion cracking in a given environment is directly dependent upon the level of sustained tensile stress which may result from heat treatment, forming, fit-up, or misalignment~~.

~~In contrast to the environmental deterioration process of metallic structures, non-metallic structures such as composites are not normally susceptible to degradation due to chemical interaction with the environment, but may be adversely affected by moisture, heat or radiation.~~

When evaluating the effect of the various sources of ED on the structure, consideration must be taken of the specific properties of the material being affected.

~~However, t~~

The effect of long-term aging in an operating environment has to be taken into consideration when developing the structural maintenance. ~~Sandwich composite structure subjected to pressure/temperature cycling (freeze/thaw cycling) may show deterioration due to fluid ingress after a long time in service.~~

When evaluating inspection requirements, ~~Special~~ attention should be paid to the design of the drainage system, as environmental deterioration is directly dependent on the time the structure is exposed to fluids.~~,~~

~~and insufficient drainage has been identified as a root cause in many cases of severe findings.~~

~~Note: It is important to take into account the combination of environmental effects, for example: Hydraulic fluid exposure in combination with heat causes fluid decomposition and produces phosphoric acid possibly causing severe corrosionWater ingress in combination with freezing causes the ice to expand and add additional stress to the structure possibly causing bulging, cracking, disbond or delaminations. Cabin condensation in combination with flame retarding chemicals in the insulation blankets may also promote deterioration.~~

Rating Accidental Damage

Accidental damage rating systems should include evaluations of the following

a. Susceptibility to minor (not obvious) accidental damage based on frequency of exposure to and the location of damage from one or more sources, including:

1. Ground handling equipment
2. Cargo handling equipment
3. Those resulting from human error during manufacture, maintenance, and/or operation of the aircraft, that are not included in other damage sources.
4. ~~Rain,~~ hail, etc.
5. Runway debris
6. Lightning strike
7. ~~Water entrapment~~

7. **Spillage (discrete event)** ~~Fluid contamination / entrapment~~

Rating Environmental Deterioration (non-metals)

Environmental deterioration rating systems should allow for evaluations of susceptibility to, and timely detection of, structural deterioration (e.g., delamination and disbonding).

Susceptibility to deterioration ~~(e.g., loss of stiffness)~~ is assessed **based on two factors: the structure composition/design and the likelihood of exposure to specific env. Conditions.**

The structure composition/design should cover the material type, production techniques, structural design and surface protection.

The likelihood of exposure depends on factors such as the location of the installation and installed protective systems, coupled with the AD likelihood.

~~on the basis of materials subjected to environmental sources and the adequacy of the protective system~~. ~~For example:~~

~~a. Aramind Fiber Reinforced Plastic (AFRP, also known as Kevlar) is sensitive to Ultra-Violet (UV) light, moisture and other fluids, when directly exposed.~~

~~b. Glass Fiber Reinforced Plastic (GFRP) may undergo long term degradation when directly exposed to UV light, but otherwise has low sensitivity to the environment.~~

~~c. Carbon Fiber Reinforced Plastic (CFRP) has low sensitivity to the environment.~~

~~The rating system should take into account specific sensitivities of the applied production technique (e.g. wet hand layup, automated prepreg tape layup, resin transfer moulding, vacuum infusion), structural design. (e.g. monolithic, sandwich, co-bonded/co-cured stiffeners, bonded or bolted/riveted joints) or resin type (e.g. Phenolic, BMI, Epoxi).~~

~~Susceptibility to delamination and disbonding or to fluid ingress into permeable materials is assessed on the basis of material type, adequacy of the protective system, and structural composition (e.g., honeycomb or foam sandwich and solid laminate), coupled with the likelihood of AD, and exposure to certain environmental conditions.~~