Progressive Failure Analysis Static (PFA_STATIC)

Product Highlights:

- Predicts the maximum loads that composite and metallic elements and structures can sustain using a step-by-step virtual loading procedure that takes into consideration material degradation, nonlinearity and changes in structural geometry. Degradation of material properties is based on 1) matrix plasticity and micro-cracking; 2) fiber orientation changes and breakage; and 3) environmental effects and manufacturing defects.
- Predicts crack initiation and growth. The program computes various damage locations and failure modes in composites caused by the application of external static loads, temperatures and environmental effects.
- Predicts damage events at different material scales beginning with the micro-cracking in fiber, matrix and fiber/matrix interface. Damage propagation is tracked from the micro-level to ply, laminate and structural levels.
- Optional use of conventional fracture mechanics approaches such as Virtual Crack Closure Technique (VCCT) and Discrete Cohesive Zone Model (DCZM).
- Predicts the post-buckling response of a composite structure based on the superposition of a required scaled buckle shape on the initial geometry of the structure.
- Predicts the time to failure as well as time-dependent crack initiation and growth in composite elements and structures caused by external static loads, temperature and environmental effects (creep response).
- Effective for permeability and damage tolerant design of composite structures. The program computes crack density and corresponding material degradation in composite materials during the loading process.
- Can be used as a virtual testing tool to reduce physical experimental testing by closely simulating the actual testing process.
- Comes with its own default finite element solver MHOST.
- Integrates numerous commercial FEM software's including: MSC.NASTRAN, MSC.MARC, ABAQUS, ANSYS and LS-DYNA. Allows the user to import, handle and run finite element models prepared for MSC.NASTRAN, MSC.MARC, ABAQUS, ANSYS and LS-DYNA.

Applications/Benefits:

- Aerospace, automotive and construction industries.
- Prediction/characterization of complicated failure mechanisms that can occur in aerospace and automotive composite structures.
- Prediction of damage and fracture initiation, progression and structural collapse.
- Determination of the ultimate strength of composite and metal structures.
- Determination of the residual strength of a composite structure after impact/fatigue.
- Prediction of inspection intervals and certification requirements.