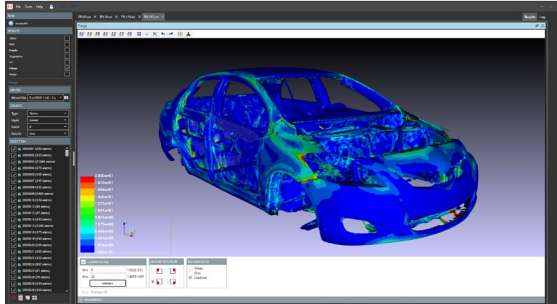




MSC CAEfatigue – Embedded Solutions for Fatigue

Product Overview



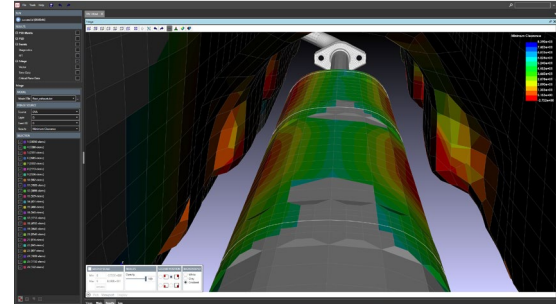
CAEfatigue (Cf) is a package of software products that cover the topics of Fatigue, Random Response, Loads Management and Test Design. It is a *modern alternative* to existing software, which is both *Customer Driven* and *Technically Innovative*.

Embedded Fatigue is a unique concept where the Cf solver based algorithms from the 4 Cf packages are directly embedded within the MSC Nastran (or Marc) analysis environment. The 4 Cf packages are,

- Cf TIME
- Cf RANDOM
- Cf FREQUENCY
- Cf PREMIUM

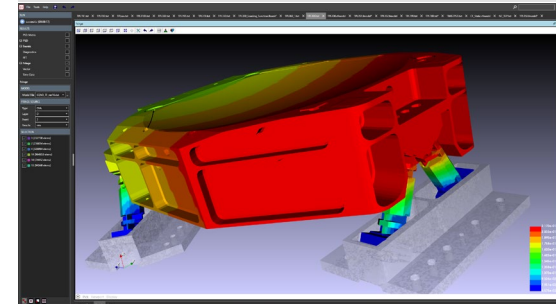
MSC Nastran v2021 includes most of the solver capabilities from Cf TIME and Cf FREQUENCY. During the course of 2021 further features from the full Cf package will be incorporated into MSC Nastran, as well as a MARC solution sometime later in 2021.

Features



- New solver algorithms mean **up to 20 Times Faster** than competition for larger models.
- Static analysis supported through **Linear Static Superposition**.
- Dynamic analysis supported through **Modal Transient Superposition**.
- **Stress-Life** and **Strain-Life** methods supported.
- **Goodman, Gerber, Morrow, SWT, Walker** and **MMPDS** mean stress options.
- **Von-Mises, Absolute Maximum Principal** and **Normal Stress** on Critical Plane supported.
- **S-N and E-N material auto generation** from static properties.
- **Sine-On-Random** mixed loading analysis.
- **Narrow Band on Random** loading analysis.
- **Simultaneous sines with/without random** (e.g., MIL-HBK-810).
- Weld fatigue using **BS7608**.
- **Seam Weld Fatigue** using Volvo Chalmers approach in either time or frequency domain.
- **Spot Weld Fatigue** using **Rupp (ACM2)** approach.

Case Studies



2014, **Solver Embedded Fatigue**, SAE World Congress, April 2014. Work done with **Navistar, Chicago**, on full body fatigue of truck cab systems in the time domain.

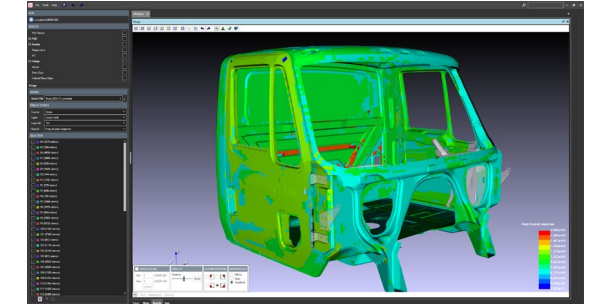
2014, **Time vs Frequency Domain Analysis for Large Automotive Systems**, SAE World Congress, April 2015. Work done with **Navistar, Chicago**, on full body fatigue of truck cab systems in the frequency domain.

2016, **A Comparative Study of Automotive System Fatigue Models Processed in the Time and Frequency Domain**, SAE Paper 2016-01-0377. Very important time v frequency domain benchmarks study done with **Ford, Dearborn and Ford Brazil**.

2017, **Sine on Random Vibration Fatigue**, NAFEMS World Congress, June 2017. Work done with **Navistar, Chicago**, on sin-on-random analysis for truck brackets.

2020, **Full Body Car Analysis in the Time and Frequency Domains - Sheet, Spot and Seam Weld Fatigue Benchmark Studies**. SAE World Congress paper 2020-01-0195. Work done with **Ford, US**, on loads simplification and surrogate loads analysis.

Typical Use Cases



- Apply **Base Shake** in X, Y, Z directions (consecutively) then calculate fatigue damage.
- **Fatigue (Durability) Calculations** using user defined load schedules.
- Determine **Collision Probabilities (Rattle)** between parts.
- Push loads from the input location to “internal” locations (**Loads Cascading**)
- **Full Body Fatigue Analysis** in either time or frequency domain to determine sheet fatigue and spot weld fatigue in one analysis.
- **Seam Weld Fatigue** in either time or frequency domain.
- **Sine-on-Random** vibration fatigue analysis.
- Other **Mixed Loading** analysis like Narrow Band on Random or Consecutive Sines on Random (gunfire).

