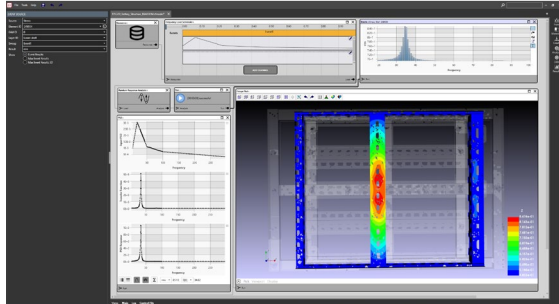# MSC **CAEfatigue – RANDOM PACKAGE**

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*. The software also provides an embedded *Technical Transfer* training package with 100's of hours of training by Dr Neil Bishop.

Cf RANDOM is one of 4 packages within the software that preforms frequency domain random response calculations with static or dynamic systems created within Nastran, Abaqus, Optistruct, or Ansys FE environments.

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

Cf is unique in offering a *Process Flow GUI* and *Control File GUI for batch runs*.

Nastran, Abaqus, Optistruct, and *Ansys* are supported for most analysis types.

Features
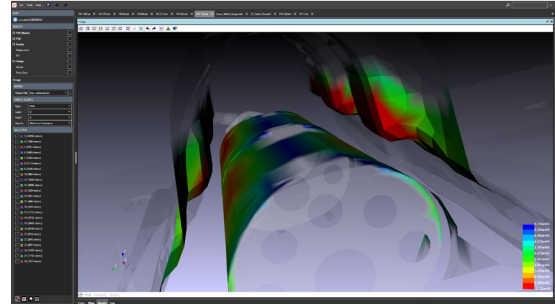
- *Modern User-Friendly Process Flow* retains all the advantages of a batch driven process.
- *Base Shake single PSD* loading supported.
- *Multiple input Loading* (with Cross PSD's) supported.
- *MSC Random type outputs* available, PSD,s, RMS fringe plots, cumulative RMS, relative response for stress, displacement, velocity, acceleration, force.
- *Complex Equivalent Stresses* include Signed Von-Mises, and Absolute Maximum Principal.
- *User Friendly* connection to solver transfer functions.
- *Non-Linear Stress-Strain Data* processing available where Neuber is switched off.
- *Unique Loads Scheduler* can be used to define loads, events and duty cycles.
- *Unique moment sum and other new algorithms* mean *up to 100 Times Faster* than competition.
- *Collision Detection* between adjacent parts.
- *Loads Cascading* from to internal locations.
- *Loads Conditioning* (time to frequency domain) with automatic and semi-automatic parameters.
- *Freq-at-Peak-Response* highlights dominant loading frequency.
- *Diagnostic Tools* shows channel influence on response.

Case Studies
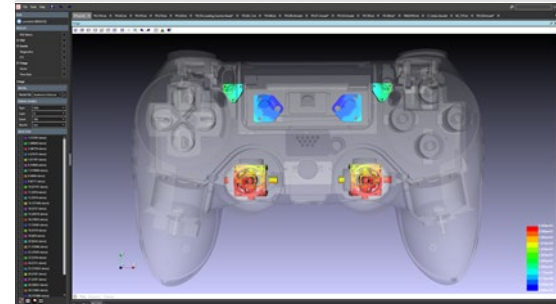
2019, *Loads Conditioning for Frequency Domain Analysis*: NAFEMS Paper NWC19-378. Work done with *FCA, Michigan*, on the topic of loads conversion (FFT) from time to frequency domain.

2019, N Bishop, *Loads Enveloping*: NAFEMS World Congress 2019, Paper NWC19-382. Work done with *Ford, Brazil and Ford, US* on loads simplification.

2020, *Loads Cascading for Full Vehicle Component Design*. SAE World Congress paper 2020-01-0762. Work done with *Ford, Germany,* on loads cascading.

2017, *Simultaneous Durability Assessment and Relative Random Analysis Under Base Shake Loading Conditions*, NAFEMS World Congress, June 2017. Work done with *OHB, Germany (Satellite company)* on random response (and fatigue analysis)of satellite payload.

Typical Use Cases
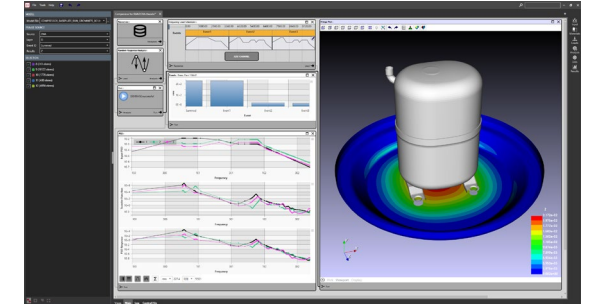
- Apply *Base Shake* in X, Y, Z directions (consecutively) then calculate displacement, acceleration, force or stress response, expected zeros E[0], expected peaks E[P] or bandwidth (γ).

- *Loads Conditioning*: Convert time based channel data (e.g., in RSP/CSV format) into its equivalent PSD Matrix format (PSDM).

- Apply *Full Body PSD Matrix Loading* data to multi-input systems like full car bodies.

- Apply *Acoustic Patch Loads*.

- Determine *Collision Probability* between parts or *Relative Random Response* between2 nodes.

- Development of *Enveloping Functions* to simplify testing.

- "*What If*" scenarios using notch function to simulated adjustments to the FRF data.

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