

A finite element solver, by Michigan Engineering Services (MES), suitable for mid to high frequency vibro-acoustic simulations. EFEA calculates structural vibration and interior noise using a small number of finite elements.

## Product Highlights

- Significant computational efficiency using only a small fraction of elements
- Retains a direct connection with the physical design through its finite element based model
- No modal density information is required, increasing accuracy
- Integrated with HyperMesh and HyperGraph

## Benefits

### A finite element model is used for mid to high frequency analysis

Complements conventional finite element solvers and is a common model development process.

### Computational efficiency

Alternative designs can be evaluated rapidly. Fast turn around times allow simulations to influence the design.

### Versatility

Applicable to noise and vibration simulations in different engineering disciplines. Wide knowledge base.

### Accuracy

Many validation studies are available in the literature. Reliable results.

## Capabilities

### The data file for the EFEA solver uses the NASTRAN format

The model can be generated in HyperMesh and exported in NASTRAN format.

### The results from the EFEA solver are reported in NASTRAN format

The results can be post-processed and visualized in HyperMesh.

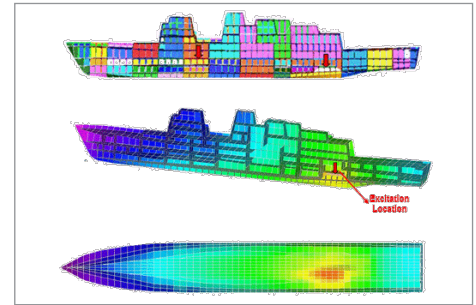
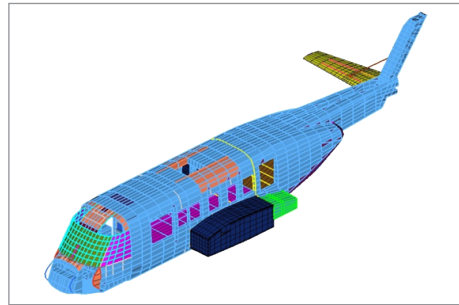
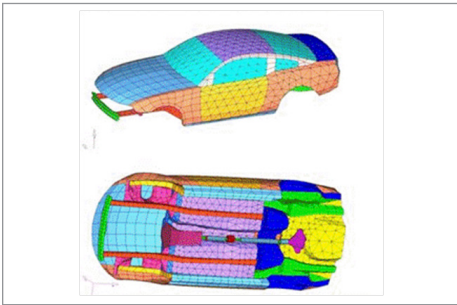
### Element Library

Since energy variables are used in the EFEA specialized formulations are necessary for all elements. The available elements allow modeling of structural damping treatment and connectors between structural elements.

### Joint Library

Joint elements are used in EFEA for

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[altairhyperworks.com/partner/efea](http://altairhyperworks.com/partner/efea)



capturing and representing the power transfer characteristics at connections between different components and at interfaces between different domains. Joint elements are unique to the EFEA; a library of joint elements is available in the EFEA solver for allowing modeling of complex structural acoustic systems from many disciplines. Data cards with a NASTRAN-like format are used for defining the joint elements

#### Automated generation of joint elements

An automated “pre-efea” processor uses the topology of the finite element model, the properties, and the interfacing domains for automatically identifying all locations where joints are needed. The original finite element model is automatically augmented and new joint elements are added in the original data file automatically for completing the model definition. The generation and definition of joints does not require any effort by the analyst.

#### Excitation

Mechanical excitation can be applied on structural members. Acoustic sources can prescribe the excitation in acoustic spaces. TBL excitation can be easily defined on the outer part of the model. Exterior acoustic loading can be defined as excitation on the outer part of an EFEA model for air-borne noise simulations.

#### Frequency dependent properties and excitation

The frequency dependency of material properties and of the excitation can be defined in the EFEA data file

#### About MES

Michigan Engineering Services, LLC (MES) was founded in 2002 as a research and development company, specializing in developing commercial software and advanced technology for engineering simulations. MES’ activities span both the defense and the commercial industrial sectors. Through the engineering services component of MES an efficient technology transition is facilitated to its customers. MES is located in Ann Arbor Michigan. Due to the availability of high quality technical talent in the Ann Arbor area, created from the presence of the University of Michigan, the technical staff of MES is a dynamic group of highly educated and motivated individuals with a commitment to technical excellence. MES has an established track record in the areas of structural vibrations and acoustics; dynamic simulations due to explosive loads; and in multi-disciplinary design optimization. Customers can find in MES a reliable technical partner that draws experience from both commercial and defense related engineering applications. MES delivers smart engineering solutions in a timely manner, while offering a highly competitive pricing structure.

#### About Altair Partner Alliance

Altair’s HyperWorks platform applies a revolutionary subscription-based licensing model in which customers use floating licenses to access a broad suite of Altair-developed, as well as third-party, software applications on demand. The Altair Partner Alliance effectively extends the HyperWorks Platform from more than 20 internally developed solutions to upwards of 60

applications with the addition of new partner applications. Customers can invoke these third-party applications at no incremental cost using their existing HyperWorks licenses. Customers benefit from unmatched flexibility and access, resulting in maximum software utilization, productivity and ROI.

#### About Altair

Altair is focused on the development and broad application of simulation technology to synthesize and optimize designs, processes and decisions for improved business performance. Privately held and headquartered in Troy, Michigan, USA the company operates globally to serve customers in a diverse range of industries including automotive, aerospace, defense, meteorology, architecture and construction, energy, electronics, and consumer goods.

**"The EFEA solver complements the collective capabilities of the HyperWorks partners by adding the opportunity for customers to conduct mid- to high-frequency vibro-acoustic analysis using finite elements, a capability that was unavailable within the program until now."**

Nick Vlahopoulos  
Chief Technical Officer  
Michigan Engineering Services