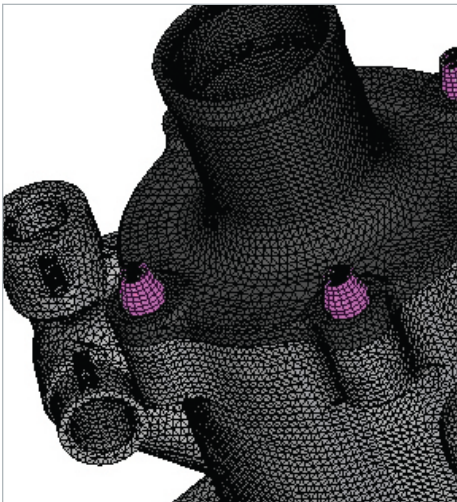


## Eaton's Aerospace Group Improves Efficiency and Accuracy in Analyzing Hydraulic Systems with HyperWorks



Powering Business Worldwide

### Key Highlights

**Industry**

Aerospace

**Challenge**

Improve efficiency in meshing

**Altair Solution**

Speed, accuracy and confidence with HyperMesh

**Benefits**

- Time savings
- Accurate and reliable results

### Customer Profile

The Hydraulic Systems Division of Eaton's Aerospace Group designs hydraulic components and systems on many of the world's military and commercial aircraft in the skies today.

Eaton conducts virtual testing of many of its designs. "We typically put our products through a digital prototyping process before proceeding with any development or qualification testing," says Analysis Group Manager Doug Scott. His group in Jackson, Mississippi, conducts stress analysis, computational fluid dynamics and dynamic simulation for hydraulic pumps, actuators,

motors and related components. It is especially focused on fatigue analysis and pressure analysis. "We want to test that the component works as expected," Scott explains, "and one way we do that is by incorporating FEA analysis techniques. Then once we have confidence in the design we proceed towards qualification testing with the actual component."

Every day, the Analysis Group analyzes parts or assemblies for a variety of aircraft at the front end of the product-development process to determine whether components meet loading requirement.

# Eaton's Aerospace Group Success Story



“HyperMesh makes my job easier, it gives me a very high level of confidence and allows me to tackle a multitude of meshing problems.”

**Ahmad Sereshteh,**  
Senior Stress Analyst  
Hydraulic Systems Division  
Eaton's Aerospace Group

## The Challenge: Need for Improved Efficiency in Meshing

Before 2002, Eaton's Analysis Group, in Jackson, Mississippi used a process built into a solver for use on finite-element models. “Earlier meshing techniques were cumbersome,” notes Eaton's Senior Stress Analyst Ahmad Sereshteh. “It was designed for structural analysis, not finite-element analysis, and it did not always provide the quality mesh we needed when dealing with the very complex hydraulic components. For a product with a simple geometry, like a chassis bracket, it was fine; but meshing

complex hydraulic component geometry required a great deal of effort and time.”

## The Solution: Speed, Accuracy and Confidence with HyperMesh

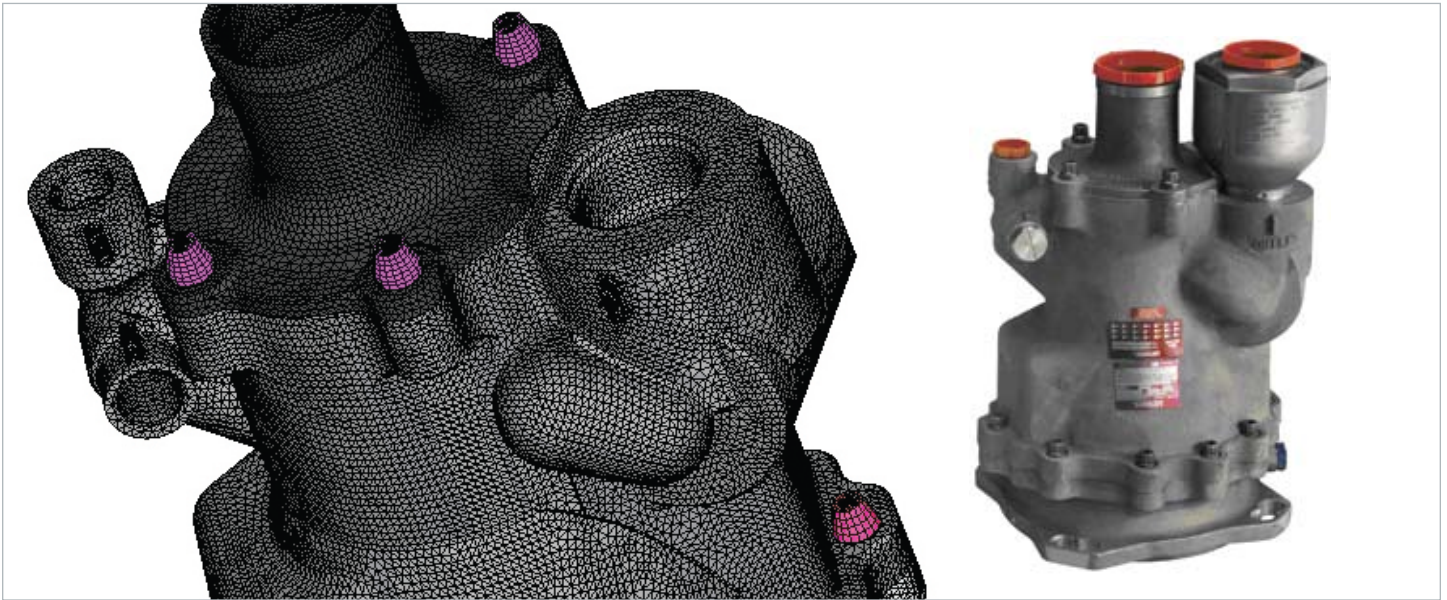
Sereshteh had used HyperMesh, part of Altair Engineering's HyperWorks suite, for 20 years in Eaton's automotive division, employing it in truck applications. When he was transferred from Southfield, Mich., to Eaton in Jackson, Miss., he introduced his new team to the benefits of HyperMesh.

“I had used HyperMesh in Michigan and knew how valuable it was,” Sereshteh recalls.

“It took a minimal effort to convince my colleagues in Jackson that HyperMesh would shorten the time required for us to develop a solid model.”

To demonstrate the capabilities of HyperMesh, Sereshteh used one of his early challenges in the hydraulics division — an Engine Driven Pump (EDP) cylinder block with a fairly complex geometry. With the previous process, creating a finite-element model for that component was challenging and would take three to four days to complete.





*Eaton's Aerospace Group - Engine Driven Pump HyperMesh Model and Engine Driven Pump*

"I said that I could create the same model in less than a day with HyperMesh," Sereshteh recounts. "That was a selling point for me to get our first HyperWorks license for trial."

Today, the Eaton team uses HyperMesh to analyze complex internal fluid passages, for example, determining the proper angle at which they should intersect and the appropriate positioning of their centerlines.

"We had looked at other applications that weren't even able to get a good mesh and therefore wouldn't have been as accurate," says Scott. "We did some benchmarking and convinced ourselves that HyperMesh could provide significant gains in efficiency and accuracy."

### **The Results: Efficiency, Accuracy, Reliability**

Finite-element analysis is a relatively new approach in the aircraft industry. Sereshteh observes that, when early aircraft were

built the industry had no such analysis capability. Instead, designers called on 200 mathematicians to each solve one element of the wing design and then pass the results to the next mathematician.

"Now, with HyperMesh, I can complete the product design in less than half an hour, with much more accuracy and a high level of confidence in the result," Sereshteh speculates.

Scott notes that his group has seen a significant efficiency improvement since it started using HyperMesh.

Sereshteh says he found HyperMesh "to be a very, very powerful package that delivers a good-quality, robust mesh than can be delivered to a solver with a good result. I have a great deal of confidence that HW can create any finite model, no matter the size, shape or number of parts with minimal effort."

In the future, Eaton's Analysis Group expects to put increasing emphasis on using its HyperWorks suite to optimize designs, reducing product weight while meeting all load requirements. The Analysis Group has also used OptiStruct, an optimization tool within HyperWorks, in development of future components.

"HyperMesh enables us to tackle problems with varying degrees of complexity in less time," Sereshteh says "We appreciate Altair's developing this code to make our lives much easier."

Scott adds, "Altair always has had excellent technical support, sales support, and support for multiple operating platforms. I appreciate that HyperMesh can operate on Linux, Unix or Windows and still retain all its functionality. Not every application can do that."

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**Success Stories**  
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Altair empowers client innovation and decision-making through technology that optimizes the analysis, management and visualization of business and engineering information. Privately held with more than 1,300 employees, Altair has offices throughout North America, South America, Europe and Asia/Pacific. With a 25-year-plus track record for innovative product design and development, advanced engineering software and grid computing technologies, Altair has more than 3,500 corporate clients representing the automotive, aerospace, government and defense, and consumer products verticals. Altair also has a growing client presence in the life sciences, financial services and energy markets.



Performance Simulation Technology

HyperWorks is an enterprise simulation solution for rapid design exploration and decision-making. As one of the most comprehensive, open-architecture CAE solutions in the industry, HyperWorks includes best-in-class modeling, analysis, visualization and data management solutions for linear, nonlinear, structural optimization, fluid-structure interaction, and multi-body dynamics applications.

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