

Femap with NX Nastran

## Columbia Helicopters

Keeping the helicopters flying

### Industry

Aerospace and defense

### Business initiatives

Regulatory compliance

### Business challenges

Perform repairs as quickly as possible

Increase helicopters' lifting capacity

### Keys to success

Industry accepted FEA solution

Good support from VAR

### Results

Significantly faster part validation for FAA approval

Lower costs and fewer delays related to physical testing

Optimized weight reduction for greater lifting capacity

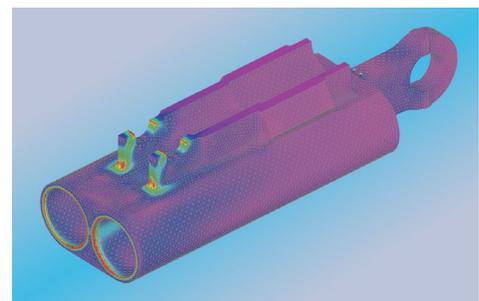
### Femap with NX Nastran speeds repair operations involving critical parts

#### Heavy lifting – any time, anywhere

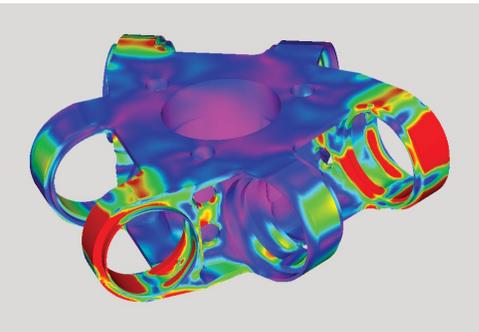
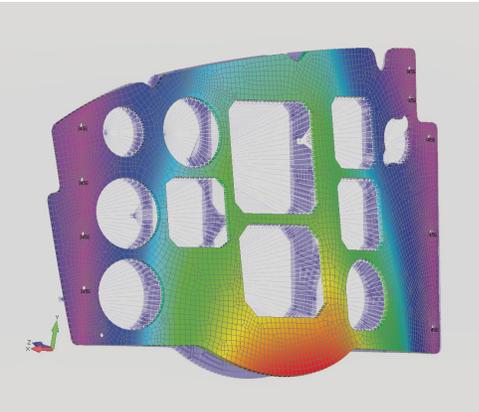
This pioneering supplier of helicopter lifting services began in the late 1950s as one man with one helicopter giving rides at county fairs. Today, Columbia Helicopters is one of the largest heavy-lift helicopter companies in the world.

Founder Wes Lematta began the company with a used Hiller 12B helicopter; today the company has a worldwide fleet of more than 30 aircraft and approximately 800 employees. Its helicopters have been used on construction projects, for oil exploration on Alaska's North Slope, and for helicopter logging (helilogging), an area in which Columbia Helicopters is the world leader. Its helicopters have also made appearances in a number of movies including Demolition Man and The Lost World: Jurassic Park.

Because the helicopters are only making money when they're in use, it's critical that repairs are made quickly. The long lead times of some of the replacement parts, combined with the company's relatively small size, make this challenging at times. "When the helicopters sit idle, not only does it cost Columbia Helicopters, but it could cost our customers as well," says Ron Heberlein, a senior mechanical engineer at Columbia Helicopters. "Maintaining an availability rate of greater than 97 percent



requires a great deal of planning, especially when lead times for complex parts can be up to two years. If we can decrease a lead time on a part by 10



percent that reduction can help to increase our availability rate, which is critical to our continued success."

#### Validating performance in software

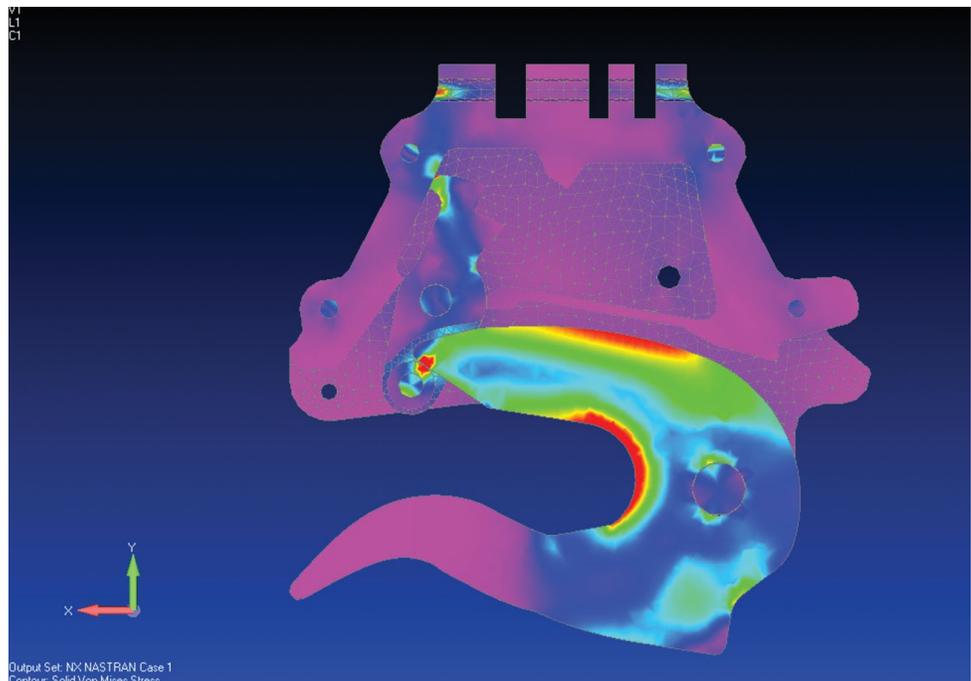
The use of finite element analysis (FEA) is turning out to be very helpful to Columbia Helicopters in keeping its helicopters in the air. The company is using this technology to validate the performance of critical parts to the satisfaction of the FAA, and in some cases getting the helicopters back into operation much sooner than would have been possible without FEA. And now that the company has purchased the type design for its Boeing 107 and 234 helicopters, it has also begun using FEA to reduce the weight of some parts, where practical. "The lighter the helicopter is, the more it can lift; and the more it can carry in one load, the more money we make," explains Heberlein. "With FEA, we can validate how much material we can remove from a part and still maintain safe margins."

Columbia Helicopters' FEA solution is the Femap™ with NX™ Nastran® software

bundle from Siemens PLM Software. The company chose this solution because of its acceptance by colleagues in the industry. "Our FAA designated engineering representative (DER) uses Femap, and for him to use it is a big vote of confidence for the software," says Heberlein. The company purchased Femap with NX Nastran from the Siemens PLM Software VAR, Predictive Engineering, which provided a three-day training class onsite. The VAR also provides ongoing support. "George Laird (president of Predictive Engineering) is by far the best software reseller in terms of training, and any question we have, no matter how big or how small or how stupid, he's willing to take time out of his day to answer," Heberlein adds.

#### Supplementing physical testing

Engineers at Columbia Helicopters are in the process of creating digital models of the 107 and the 234 helicopters. (These helicopters were both developed prior to widespread use of CAD.) To prepare a finite element analysis, they import the CAD geometry into Femap, simplify it as



## Solutions/Services

Femap

[www.siemens.com/plm/femap](http://www.siemens.com/plm/femap)

NX Nastran

[www.siemens.com/nx](http://www.siemens.com/nx)

## Customer's primary business

Columbia Helicopters is one of the largest heavy-lift helicopter companies in the world.  
[www.colheli.com](http://www.colheli.com)

## Customer location

Aurora, Oregon  
United States

## Partner

Predictive Engineering

+1 503 206 5571

+1 888 316 3603

[www.predictiveengineering.com](http://www.predictiveengineering.com)

**"Our FAA designated engineering representative (DER) uses Femap, and for him to use it is a big vote of confidence for the software."**

Ron Heberlein

Senior Mechanical Engineer  
Columbia Helicopters

necessary, and then define the analysis mesh. This is done automatically using Femap automatic meshing functionality, and then refined by hand if necessary.

At times the analysis will involve a solid object that is represented by tetrahedral elements as well as aircraft skin or stringers that are represented by beam or plate elements. "Creating meshes with multiple element types is much easier in Femap than anything else I've dealt with," says Heberlein. The analyses that Columbia Helicopters performs are typically linear static analyses. Depending on the part, they can go from importing the CAD model to results within an hour. A larger assembly such as one with aircraft skin and stringers typically takes about one day to get results.

The use of FEA has been very beneficial in situations where critical parts are needed in repair or maintenance situations. In one example, the company had several rotor parts that had not been machined perfectly but they were able to use FEA to show that the parts still met the required performance criteria. "We submitted to the FAA a validation report and a structural substantiation report showing Femap stress plots and how they compared to the original Boeing analysis," says Heberlein. He estimates that this cut the time for getting the FAA approval by a significant amount compared to using physical testing alone. More importantly, the ability to use those existing rotor parts, versus waiting one to two years for new ones, was a huge financial advantage for the company.

The other use for FEA is for reducing the weight of the helicopters. Here, too, the ability to reduce the amount of time-consuming and costly physical testing



is a significant advantage. Heberlein recently used FEA to reduce the weight of an external hook by almost 20 percent. In addition to avoiding the expense of destructive physical testing, Heberlein had confidence that he had achieved the optimum weight reduction for that part. "Without FEA you could go too far or not far enough in the weight reduction," Heberlein says.

Femap with NX Nastran has become an essential technology for Columbia Helicopters. In keeping its helicopters flying and in helping make them as efficient as possible, this FEA solution contributes to the company's bottom line.

## Siemens Industry Software

Americas +1 800 807 2200

Europe +44 (0) 1202 243455

Asia-Pacific +852 2230 3308

[www.siemens.com/plm](http://www.siemens.com/plm)

© 2011 Siemens Product Lifecycle Management Software Inc. All rights reserved. Siemens and the Siemens logo are registered trademarks of Siemens AG. D-Cubed, Femap, Geolus, GO PLM, I-deas, Insight, JT, NX, Parasolid, Solid Edge, Teamcenter, Tecnomatix and Velocity Series are trademarks or registered trademarks of Siemens Product Lifecycle Management Software Inc. or its subsidiaries in the United States and in other countries. Nastran is a registered trademark of the National Aeronautics and Space Administration. All other logos, trademarks, registered trademarks or service marks used herein are the property of their respective holders. Z3 14315 11/11 B