

## **FEM Fatigue Analysis of Composite Helicopter Hub Flexure**

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### **Summary**

The most of development Helicopters are used composite material for hub flexure recently. The Composite flexure makes it possible to design of hingeless rotor. It takes the function of hinge against moment of flapping, fathering and lead-lagging. Because of the reason, the flexure is very complicated structure to analysis. In this study, the flexure is modeled to laminated FEM model for composite analysis. First of all, static failure analysis is accomplished by using Tsi-Wu and maximum stress theory. Second, vibration analysis is performed to find natural frequency of the flexure. Finally, the fatigue life analysis is achieved by in-house code which is fatigue life estimation program for composite material. In case of fatigue analysis, Fatigue load spectrum is generated by FELIX. And fatigue experimental data is estimated by Kriging meta model to consist S-N curve for each of layers. The Kriging meta model is one of optimization method. And it can generate better regression curve than general regression method for nonlinear characteristic particularly. To prove of reliability, Analysis of variance concept is adopted to compare between experimental point and estimated point. So on, fatigue life can estimated with it have more accuracy. All of this analysis can be use for design of the flexure in primary helicopter construction. It can be use for manifold design variable like that to decide size of flexure and angle of ply.

**keywords:** Composite Flexure, Failure Analysis, Vibration Analysis, Fatigue Analysis, Kriging meta model, ANOVA, FELIX.

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