Composite Helicopter Rotor Blades – From Aftermarket to OEM

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Strain gages, accessories, and a data acquisition system used by Van Horn Aviation to collect critical data during fatigue life and flight testing for its line of lightweight composite helicopter rotor blades.

Company/Institute: Van Horn Aviation, L.L.C.

Industry/Application Area: Aviation / helicopters

Product Used:

- MCA-2 M-Prep Conditioner
- MN5A-2 M-Prep Neutralizer
- SCP-2 Silicon-Carbide Paper
- CEA-00-250UN-350 Strain Gages
- EA-00-125PC-350 Strain Gages
- CEA-06-187UV-350 Strain Gages
- CEA-06-125UT-350 Strain Gages
- CPF-50C Terminals
- RSK-4 Rosin Solvent
- M-BOND 200 Kit
- M-BOND AE-15 Kit
- 134-AWN-W 500' Wire
- 134-AWN-G 500' Wire
- 134-AWN-B 500' Wire
- 134-AWN-R 500' Wire
- M-COAT A Kit
- System 8000 Data Acquisition System
- StrainSmart Software

Image 1: 500-pound load test

The Challenge

The aerospace industry is constantly striving to reduce operating costs through improved aerodynamics, enhanced performance, and increased service intervals. If any of these variables can be improved, helicopter payload capacity increases while operating costs are lowered.

The Solution

It is rare that the replacement of a single component can accomplish all of the goals mentioned above, but Van Horn Aviation (VHA) recently achieved just that with a new line of helicopter rotor blades. The vast majority of helicopters in operation today utilize aluminum rotor blades, an antiquated technology that has been used for decades with little improvement. VHA's game-changing solution was to develop a line of aftermarket lightweight composite rotor blades.

Image 2: Inspecting strain gages on fatigue test blade section

Image 3: Horizontal fatigue test frame

Not only did these innovative blades have to demonstrate extended service life and other improvements, but they also had to pass all the demanding specifications of the FAA. Even with VHA's rigorous manufacturing quality standards, thousands of hours of lab and in-flight testing were performed to ensure that the lightweight, high-performance components met all safety standards. VHA turned to the experts at Micro-Measurements for the necessary strain gages, accessories, and data acquisition system to collect critical data during fatigue life and flight testing.

Image 4: Instrumented Bell 206 Mast

The User Explains

"The results speak for themselves", says Dean Rosenlof. Our rotor blades not only reduce weight and increase performance and service intervals, but they exceed the safety and lifespan of conventional rotor blades. These products have not only become the aftermarket solution of choice for existing aircraft, but have now been chosen by companies like Bell Helicopter for their OEM applications.

"We at Van Horn Aviation rely on Micro-Measurements' foil strain gage sensors, accessories and DAQ system for collection of critical data during flight testing and in all phases of structures testing for our line of composite helicopter rotor blades. A large investment of time and money go into testing and having reliable sensors is mandatory. It is a pleasure to know that we can rely on Micro-Measurements as our complete solution provider."

Acknowledgement

Micro-Measurements would like to thank the staff at Van Horn Aviation for preparing this document for us and for giving us permission to share it with our customers and colleagues.

Van Horn Aviation (VHA) has received a Supplemental Type Certificate (STC) from the Federal Aviation Administration (FAA) for composite main rotor blades fitting the Bell 206B JetRanger helicopter. The new VHA 206B main rotor blades have been approved with an 18,000-hour service life with 2,800 hour overhauls.

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