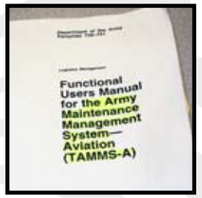
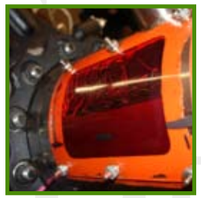
cbm@usc = success



By analyzing several years of historical maintenance records, USC has performed multiple **cost-benefits** analyses which show the impact of health monitoring systems on the maintenance burden of aircraft fleets. In one study, USC found that implementing a CBM program could **eliminate** unnecessary part removals, reduce the number of required inspections, lessen the amount of maintenance test flights, and prevent unexpected part failures.



Utilizing an advanced tail rotor drive train test facility, USC **discovered** previously unknown grease flow characteristics of the AH-64 Apache tail rotor gearbox. These findings have led to major changes to the maintenance of this part, reducing the total number of replacements by fifty percent, eliminating countless maintenance hours, and saving **millions** of dollars every year.

In similar studies at the same test facility, USC was able to demonstrate the survivability of AH-64 tail rotor drive shaft hanger bearings, often in **extremely** faulted conditions. The results of these experiments make it easier to identify faulted bearings without performing costly inspections and allow them to stay in-use until it is more **convenient** and cost effective to replace them.

contact us

For more information, please contact:
Dr. Abdel Bayoumi
bayoumi@cec.sc.edu
(803) 777-1845

cbm.me.sc.edu

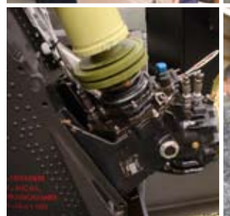
UNIVERSITY OF SOUTH CAROLINA

testing

condition-based maintenance

analysis

breakthrough



CBM

A Brief Description

Condition-Based Maintenance (CBM) is the application of health monitoring systems in the prediction and prevention of detectable component failures. In contrast to the long-held practice of preventative maintenance, in which parts are inspected and replaced at scheduled intervals, CBM utilizes real-time monitoring to efficiently diagnose faults within a component. The benefits of this approach include fewer unexpected component failures, replacement of parts only when necessary, and a reduction in the overall maintenance burden to soldiers and maintainers.

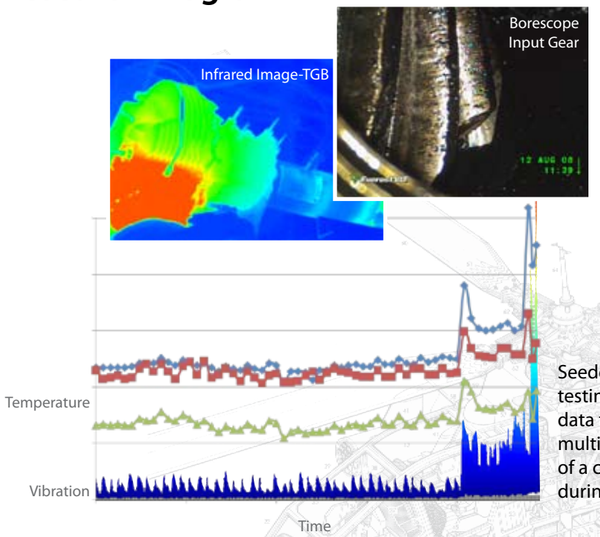
CBM History at South Carolina

The U.S. Army Aviation community has begun the rapid adoption of this new CBM paradigm and has deployed multiple Health and Usage Monitoring Systems on several of its rotorcraft fleets. The flagship of this effort has been the South Carolina Army National Guard, who, through a partnership with the University of South Carolina (USC), has demonstrated the benefits of a successfully implemented CBM program. Through several years of collaborative efforts, USC now hosts a versatile testing facility, capable of performing experiments on several aircraft components in a wide range of operating conditions.

Current Activities

In order to reach the full potential of this technology, an ongoing research effort by the U.S. Army, industry leaders, and Academia is necessary. The CBM Research Center at USC continues to lead the way in advancing this technology through rotorcraft drive train component testing, exploration of alternate sensor and signal processing technologies, as well as investigation of historical fleet data for rapid verification and integration of experimental results. Through the successes of USC's Research Program, the U.S. Army continues to see a decrease in maintenance costs, an increase in flight safety, and enhanced mission capabilities of its rotorcraft fleets.

The University of South Carolina Condition-Based Maintenance Research Program



Seeded fault testing examines data fusion and multiple aspects of a component during failure.

Component Testing

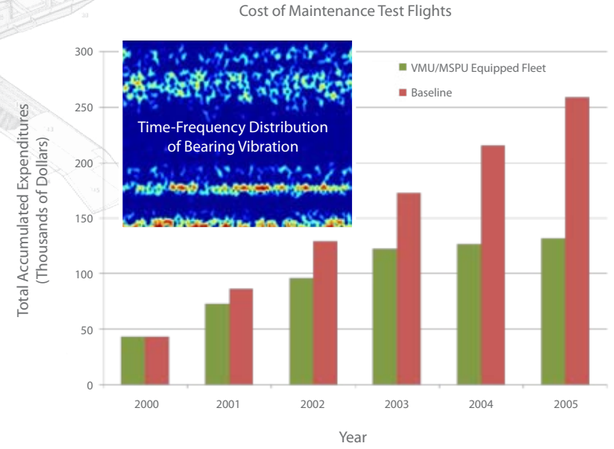
The testing facility at USC was designed and built to perform experiments on all drive train components of AH-64, UH-60, and ARH-70 airframes. Capable of providing 150% of the loading conditions experienced at full power, the test stands utilize advanced automated control and multiple data acquisition systems. The primary objectives of testing are to:

- **Perform accelerated-life fatigue tests** on seeded and naturally faulted parts.
- **Discover operational characteristics** of components and systems that are difficult to observe on actual aircraft.
- **Develop and apply new diagnostic algorithms** for rapid and efficient fault identification.

Fundamental Research

With faculty support across four departments, the university research program also focuses on developing a universal framework of CBM for a diverse and widespread application beyond its current role. Utilizing the available academic resources, as well as a wealth of historical data, this effort seeks to:

- **Explore the fundamental theories** of condition monitoring and health prognosis.
- **Promote the adoption of standards** for the widespread implementation of CBM systems.
- **Identify alternative approaches** to condition monitoring beyond the present scope of vibration-based systems.
- **Investigate new sensor technologies** and signal processing techniques.
- **Integrate and link** historically recorded maintenance events with available sensor data from aircraft fleets.



Fundamental research discovers new results and analysis techniques to support CBM objectives.