Researchers develop new method to monitor aircraft lifespan

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Carnegie Mellon University Professor Anthony D. Rollett has developed a new computational method that may help track the lifespan of U.S. Navy aircraft.

"We have created a new way of creating three-dimensional computer models of the materials used in aircraft to help us determine when an aircraft is ready for an overhaul or when it should be retired," said Rollett, a professor in the Materials Science and Engineering Department.

At present, many Navy aircraft are more than 30 years old, so military officials are seeking a more precise system for reducing the risk and cost associated with ensuring the safety of U.S. military aircraft.

"We have been collaborating for more than two years with Carnegie Mellon's Professor Rollett on the problem of predicting the fatigue-limited lifetime of structural components like those found in aircraft," said John M. Papazian, a research scientist at Northrop Grumman Corp., one of the nation's leading defense contractors.

Essentially, what Carnegie Mellon researchers have done is to refine a system already developed in collaboration with Pittsburgh-based Alcoa to map the microstructure of materials into a three-dimensional digital material. The digital material is akin to a computer program and gives researchers the ability to conduct unlimited testing of the materials using computational methods. The novelty of the approach lies in being able to

create many different examples of the material in the computer that can capture the variability of the material. This allows the results to be used in the statistically based systems that are used for tracking the lifetime of an aircraft.

"We are looking for any kind of defect in critical airplane parts," Rollett said. For example, moisture combined with dirt or salt creates perfect conditions for corrosion of airplane parts.

Industry analysts also point out that many Navy aircraft have to endure repeated aircraft carrier landings, which some aviation experts call "controlled crashes" that put significant stress on airplane frames.

Source: Carnegie Mellon University