Shared material databases: The next chapter

Unlike metals, whose properties can be known and measured in advance, the properties of composite materials are to a significant extent determined as they are manufactured into a structure. The ratio of fiber and resin, orientations of fibers, the ply schedule, the selected fabrication process and process parameters all have an effect on the ultimate performance, which cannot be known until the part is cured and subsequently tested.

Historically, this has made the process of qualifying a composite material system for use on aircraft much more time consuming, difficult and expensive than qualifying metals. Each aircraft manufacturer had to conduct its own qualification process. Even if a "new" composite material was identical to one already approved for use on an aircraft built by another company, the fabrication techniques and testing processes used for the previous aircraft application were unknown and, therefore, could not be duplicated.

The company was required to develop its own processes for structural testing, manufacturing control and repair—a process that could consume up to five years and cost millions of dollars. While this was cumbersome for large commercial aircraft OEMs, it was relatively easy to cost-justify. But for the smaller general aviation manufacturers, the process imposed a huge penalty, driving up the cost of individual aircraft and ultimately limiting aircraft sales.

In recent years, NASA, the U.S. Federal Aviation Admin. (FAA) and aerospace industry leaders have developed Handbook 17 (MIL-HDBK-17) and the NASA-conceived Advanced General Aviation Transport Experiments (AGATE) program (see HPC May 2003, p. 38), worked together to reduce the qualification process for a selection of materials from Toray Composites America, Cytec Engineered Materials, FiberCote, Advanced Composites Group, Hexion and Newport Adhesives & Composites. Many are now employed on active aircraft programs and their use has spared OEMs great expense. In addition, however, much has been discussed and some of these materials have been produced with limited success.

The AGATE method has been used to create shared databases for a selection of materials from Toray Composites America, Cytec Engineered Materials, FiberCote, Advanced Composites Group, Hexion and Newport Adhesives. Composites. Many are now employed on active aircraft programs and their use has spared OEMs great expense. In addition, however, much has been discussed and some of these materials have been produced with limited success.

The AGATE method involves creating a database that includes all the necessary information about a material, such as its properties, manufacturing process, and performance characteristics. This database is then shared with other aircraft manufacturers, allowing them to use the material without having to conduct their own expensive qualification process.

The AGATE method is an example of how collaboration and open sharing of information can lead to significant cost savings and increased performance in the aerospace industry. By reducing the qualification process, AGATE has enabled smaller general aviation manufacturers to compete more effectively with larger OEMs, and has helped to drive down the cost of aircraft. This has had a positive impact on the industry, as it has made aircraft more affordable for more people, and has helped to drive innovation and technological advancement.