

Virtual Structural Testing for Composites Today and Tomorrow

P. Ladevèze

*LMT-Cachan, ENS Cachan/UPMC/CNRS/PRES UniverSud Paris, France, ladeveze@lmt.ens-cachan.fr
EADS Foundation Chair "Advanced Computational Structural Mechanics"*

The field of laminated composite materials is both old and new. It is old in the sense that it was in the early 1960s that scientists and engineers started to study seriously and apply the vast potential of fibrous composite materials. It is new in the sense that today the development of new materials and processes as well as the emergence of new applications is accelerating, especially in the aeronautical industries; this is the consequence of considerable research and technological progress. The virtual structural testing of composites is at the heart of this composite "revolution" which the aeronautical industry has engaged in. Virtual structural testing, which consists in replacing, whenever possible, the numerous experimental tests used today by virtual tests is indeed only a first stage, albeit an important one, which is currently in its development phase. It is expected to be superseded by what we call "Robust Virtual Sizing", which goes much further than merely replacing a test machine by a computer: it consists in calculating the real-life structure itself in its environment, taking into account all sorts of lacks of knowledge. Computers, with their well-known advantages, will play an even more central role. However, the scientific stumbling blocks are not limited to computing, but also concern the material modeling of composites.

What concepts, tools and challenges go along with virtual structural testing today, and how will they evolve in the future? These are the questions we intend to discuss.