MS05: Lifetime and strength analysis of aeronautical structures (*Frédéric LAURIN, ONERA - the French Aerospace Lab, France*)

Because of their very interesting specific mechanical properties, composite materials with polymer matrix are widely used in aeronautical industries for primary structures (such as centre wing box, fuselage or wings). Moreover, some components in hot parts of engines are currently manufactured with composites with ceramic matrix. Different architectures of composite materials are considered in this mini-symposium, such as classical unidirectional plies, 2D or 3D woven composites, presenting good residual properties after impact. The objective of this mini-symposium is to exchange around the different methodologies to predict the fatigue lifetime and the strength of composite components. It is necessary to consider, at the same time, the modelling, experimental and computational aspects in order to propose methodologies which can be effectively used in design offices. Therefore, both current methodologies used in aeronautical industries and most advanced and recent models developed in laboratories, to predict failure under static or fatigue loadings, will be presented and discussed. Multi-instrumented tests (using digital image correlation, acoustic emission or X-Ray tomography) developed specifically for composite materials to identify and validate those approaches are welcome for this mini-symposium. Finally, leading researches concerning efficient computational strategies to predict fatigue lifetime and failure of large composite components will be considered. Topics of discussion will include the following:

- Multiscale damage and failure approaches for composite materials
- Model to predict the fatigue lifetime of composite materials
- Comprehension of damage mechanisms through analysis of multi-instrumented tests
- Inverse identification procedure on structural composite applications
- Numerical approaches to estimate the strength of large composite components
- Computational strategies to predict fatigue lifetime of composite structures