OVERVIEW OF CMC ACTIVITIES: FROM HIGH TEMPERATURE CHARACTERIZATION TO APPLICATIONS

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The operating conditions of current engines have reached the limits of metallic hot sections components. Therefore, the development of materials able to withstand high temperatures and aggressive environments is critical for many aerospace applications. The ever increasing need for efficiency has led to consider ceramic matrix composites (CMC) to replace metallic alloys for high temperature applications. CMCs have the potential for performance improvements, significant weight reduction and greater fuel savings due to their intrinsic properties (low density, high specific strength and fracture toughness, high temperature capabilities…). These advantages allow the integration of CMCs in hot sections (nozzles, shrouds, low pressure turbine blades, exhaust components, flaps…) to enable jet engines to operate at higher temperatures and thus improve their performances. These materials are considered among the most promising materials for the next generation of aircraft gas turbine engines. In addition, they are also being developed for applications in future aerospace turbine engines or hypersonic platforms.

Therefore, being able to characterize CMC materials and evaluate their capacities at ever higher temperatures is essential to ensure the durability and performance of systems. For this purpose, the Direction Générale de l'Armement (DGA) has been supporting developments in the field of CMC materials for many years.
Through dedicated research programs with laboratories and companies or within the framework of international cooperation, the DGA is actively involved in the development of future technologies. To increase its technical expertise on CMCs, the DGA also relies on its tests centers, which can carry out in-house tests.
In this presentation, an overview of the activities carried out at DGA on CMC materials will be presented and a focus will be made on the characterization of these materials.

Fig 1. M88 engine exhaust (SAFRAN)

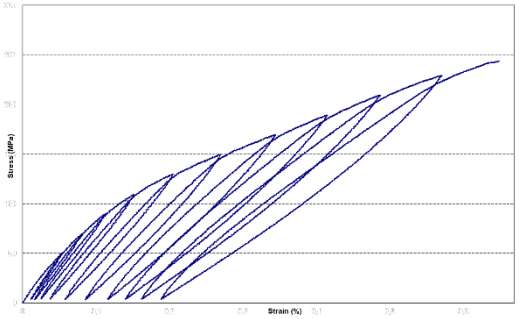

Fig 2. Tensile stress-strain curve on CMC