

# SPEAKERS' CONTACT & PRESENTATION DETAIL FORM

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## TITLE OF PRESENTATIONS

- Advanced Composite Repair Case Studies: A380 Transcowl, B777 GE90 Nacelles etc.
- Demonstration of Composite Repair Innovative Equipment & Solutions

## PRESENTATION ABSTRACT

**GMI** upgrades **existing autoclaves** to become “**Repair Enhanced Autoclaves – REA**”, using flexible blankets as the main source of heating! Even though this may sound “controversial”, this is the state-of-the-art heating solution for **addressing repair requirements of complex aeronautical parts**, such as the **A380 engine reverses**, the **B777/B787 engine nacelles** etc. This innovative solution answers to the fact that globally heating the parts in “conventional” autoclaves would **immediately distort** them, causing **severe damage**, due to **variation of thermal expansion coefficients** of involved materials.

**A380 Transcowl:** *Advanced heating system and control mode for homogeneous high temperature curing of large composite repairs - “ADVANCED”, is an R&D project* implemented under the supervision of **Aircelle (Groupe Safran)**. It concerned the development of innovative solutions either for the application of very large composite repairs, to be performed outside autoclaves, or for **Out-Of-Autoclave OOA** production. Achieving **strict temperature tolerances (+/-5 at 190°C or 225°C)** for repairs of **several m<sup>2</sup>** is challenging, but expected benefits are significant: **reduction of autoclave utilization** induces direct cuts to overall repair cost and CO<sub>2</sub> footprint, as energy requirements for OOA curing is minimal, compared to autoclave. The project mainly included **Thermal Transfer Simulation and Design of Heating Blankets** to be used in the autoclave, as well as the development of an **18-Zone, 80T/C, 48kW Power Supply and Control Unit (PS&CU)** hardware and software.

**B777 GE90 Nacelles:** **AF-KLM E&M** and **GMI** combined their expertise to design an exclusive “**adapted**” **thermal solution**. The goal was to develop the appropriate range of heating elements for **Out-Of-Autoclave (OOA)** curing of the **B777 GE90 engine nacelle**. **Air France**, being a major operator of this type of aircraft, was interested in a methodology for **~2m<sup>2</sup> internal skin replacement** and subsequent curing at **177±5°C**, in order to fully comply with the manufacturer’s specifications, while **greatly reducing repair costs and TAT**. Thanks to GMI solution, even though an autoclave is still used to provide required pressure and slightly elevated ambient temperature (i.e. 50-80°C), **heating at 120-180°C is ensured using specially designed adapted heating blankets**, at the repair area **ONLY!**

## SPEAKER BRIEF BIOGRAPHY

Mr Konstantinos Kitsianos is an Applied Physicist with Master in Computational Mechanics while being a PhD candidate in the field of composite repair simulation at the National Technical University of Athens, Greece. Working as R&I Engineer with GMI for 8 years, he has studied and developed a big number of adapted composite repair solutions for aircraft manufacturers, airlines and MROs, including the one presented above. In parallel, he has been actively involved as Researcher in more than 20 European Union R&D projects in the area of repair of composites. He participated in the preparation of 4 research papers, with several Citations and in authoring a book chapter concerning composite repairs.