

Manufacturing next generation horizontal tail plane (HTP) – the role of surface pretreatment for adhesive joints and functional coatings

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Reducing the CO₂ footprint is a key issue for the aero-industry in Europe. Drag reduction from skin-friction at the horizontal tail plane (or wing) of an aircraft can be achieved by Hybrid Laminar Flow Control concepts (HLFC). A key technical issue is to build the HLFC structure as light and as cost-efficient as possible. This goal can be achieved by adhesive bonding of a microperforated titanium panel to a CFRP substructure. Another key aspect is the deposition of functional coatings to protect the leading edge from erosion or ice formation.

Both aspects require an adequate surface pretreatment of the titanium panel. Here we report on the study of laser pretreatment to improve the bondability to titanium and on manufacturing aspects of the laser treatment on an industrial scale. IR laser and UV laser were compared for pretreatment of grade 2 titanium that was subsequently bonded with RTM6 resin. In addition, the talk gives an overview of surface pretreatment technologies studied at Fraunhofer IFAM to realize the full potential of functional coatings. Results are presented for the low pressure plasma sputter process on titanium to achieve erosion resistant coatings. For ice protection of metal surfaces an atmospheric plasma process is presented. Funding by the Cleansky 2 JTI is gratefully acknowledged.