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Abstract #XXX

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Corresponding author: van de Kamp, Bram

e-mail of corresponding author: Bram.vandeKamp@dlr.de

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### Title

## Hybrid Laminar Flow Control ready for Series Application

### Authors

Bram van de Kamp <sup>1\*</sup>, Markus Kleineberg <sup>1</sup>, Andreas Schröder <sup>1</sup>

*\* Corresponding author*

*<sup>1</sup> DLR Institute of Lightweight Systems, Lilienthalplatz 7, D-38108 Braunschweig*

### Abstract

A major objective of the Clean Sky 2 project “HLFC-WIN” is to push HLFC technology towards a competitive series application for the next generation of long-range Aircraft. The geometrical boundary conditions that have been agreed on for the project are to primarily focus on the outer wing between the engine pylon and the wing tip. Furthermore, it has been agreed that the wing leading edge, structural/aerodynamic interfaces and the wing box upper shell are mainly contributing to the drag reduction potential. The chosen, highly modular design approach with 4 similar leading-edge segments is a major enabler for both low development costs and the ability to scale masses and costs up to the complete outer wing. Despite most former HLFC approaches a no-pipe design with distributed small compressor units that can be integrated in the leading-edge structure has been selected and demonstrated.

At the current midterm stage of the HLFC-WIN project an approach to combine small hardware prototypes, CAD model data of the planned Ground Based Demonstrator and global aircraft data (XRF1 Research Platform) proved to be very successful for a first estimation of the project’s potential. There is a very clear indication that the HLFC-WIN project will be able to prove that HLFC technology is ready for future long-range aircrafts and that weight and cost related risks are well under control. Innovative industrial, high-quality CNC laser drilling capabilities for the perforated Titanium suction skin and affordable and compact high-performance compressor units may be the dominating enablers for the vastly improved applicability of future HLFC Systems. Nonetheless the inductive Wing Ice Protection System (WIPS) contributes to the improved efficiency of the HLFC system by avoiding blocking of the small diameter suction holes.

Easy and simple maintenance is another strategic goal of the HLFC-WIN project. The identified solution in this respect is to enable quick replacement of all components of the suction system in case the functionality is limited by surface irregularities or blocked micro-perforation (e.g. dents from hail strikes, surface contaminations).

Other elements of the HLFC-Win approach have been intentionally kept in a well-known and easy to certify regime in order to ensure the route to TRL4 and beyond.

Eco design does also play a significant role and the investigated manufacturing methods and materials will be down selected to be as environmentally friendly as possible. To do this, an analysis of the energy efficiency of the production approach and an analysis of the production waste, coupled with an estimation of the carbon footprint has been done.