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Recent Investigations into Laminar Flow Control for Nacelle Application

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INTRODUCTION

SANTANA (System Advances in Nacelle Technology AerodyNAmics) is a collaborative programme focused on the development of aerodynamic technologies related to the design of advanced ultra-high bypass ratio powerplant nacelles for next generation aircraft.

The programme is led by Bombardier Aerospace Belfast, with programme partners comprising both UK industrial organisations (ARA and S&C Thermofluids) and aerodynamics research teams (City University, London and Imperial College, London).

SANTANA builds upon the recently completed nacelle technology development programme EFE (Environmentally Friendly Engine) which investigated low drag technologies for nacelle application.

AIM

The aim of SANTANA is in keeping with the recently completed EFE programme; to develop new innovative technologies designed to meet the needs of improved environmental performance of aircraft engines and to reduce ownership costs. The Advisory Council for Aeronautics Research in Europe (ACARE) defined the technological paths and objectives until 2020 in its Strategic Research Agenda. A key objective of SANTANA, as it was for EFE, is to contribute to ACARE's goals through the reduction of aircraft fuel burn, thereby cutting carbon dioxide (CO2) and nitrogen dioxide (NOx) emissions, achieved through the maturation of low drag technologies with the view to inclusion on an aircraft nacelle.

KEY AREAS OF FOCUS

Examples of design studies into low drag technologies for nacelle application include:

- Transition Modelling
- Laminar Flow Wind Tunnel Testing
- Low Surface Energy Coatings
- Rain Erosion Testing
- Nacelle Lipskin Manufacturing Considerations
- Fan Bypass Duct Performance Analysis

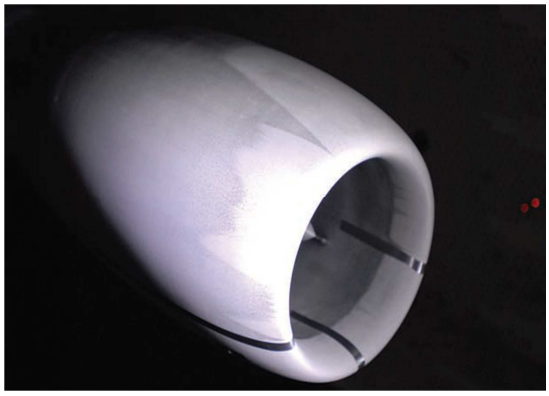

Figure 1: Natural laminar flow nacelle wind tunnel testing at ARA Bedford

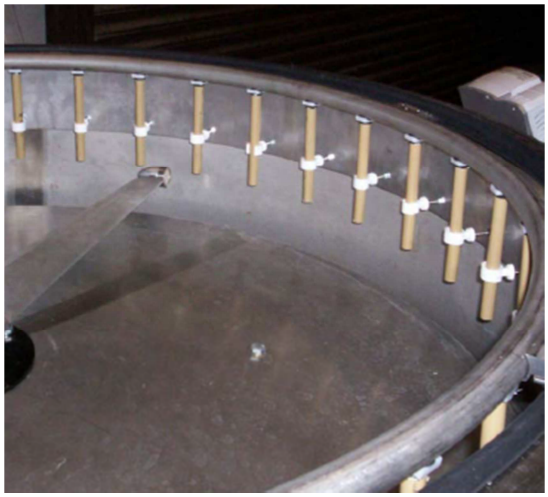

Figure 2: Whirling Arm Rain Erosion Testing at the University of Limerick

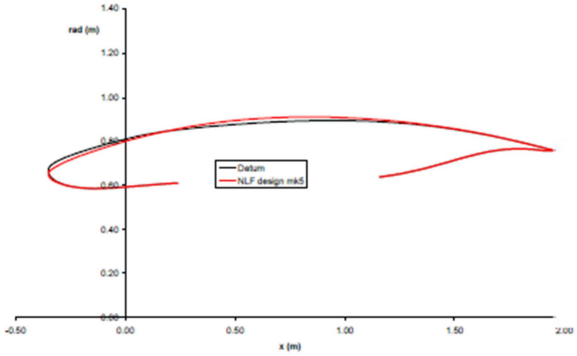

Figure 3: Nacelle Shape Optimisation for Natural Laminar Flow performed by QinetiQ