

## **Advances in Aircraft and Spacecraft Science**

Optimisation of a novel trailing edge concept for a high lift device

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### **Abstract.**

This study aimed to observe the effect of a novel concept (referred to as the flap extension) implemented on the leading edge of the flap of a three element high lift device. The high lift device, consisting of a flap, main element and slat is designed around an Airbus research profile for sufficient take off and landing performance of a large commercial aircraft. The concept is realised on the profile and numerically optimised to achieve an optimum geometry. Two different optimisation approaches based on Genetic Algorithm optimisations are used: a zero order approach which makes simplifying assumptions to achieve an optimised solution: as well as a direct approach which employs an optimisation in ANSYS DesignXplorer using RANS calculations. Both methods converge to different optimised solutions due to simplifying assumptions. The solution to the zero order optimisation showed a decreased stall angle and decreased maximum lift coefficient against angle of attack due to early stall onset at the flap. The DesignXplorer optimised solution matched that of the baseline solution very closely. The concept was seen to increase lift locally at the flap for both optimisation methods.

**Keywords:** aerodynamic design; high lift; single slotted flap; optimization; aeroacoustics; CFD