

## VORTICAL FLOW PATTERNS for HIGH LIFT for HIGH SPEED AIRCRAFT CONCEPTS

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### ABSTRACT.

Enhancing detached vortical flow over leading edges and flap surfaces allow high lift configurations in critical regimes of take-off and acceleration. In the context of the FP6 Environmentally Friendly High Speed Aircraft project HISAC, future high speed aircraft concepts were studied. Specific morphed leading edges were devised that are adapted to ultra-fine wing geometries, and enhance lift. Unsteady CFD and Wind Tunnel tests were according. Similar situations arise for high speed fighter aircraft, where integrated flap design is optimised for assuring high lifting vorticity over the leeward side. Again CFD and wind tunnel testing were performed producing qualitative agreement; however the turbulence modelling encountered greater difficulties for quantitative agreement here.

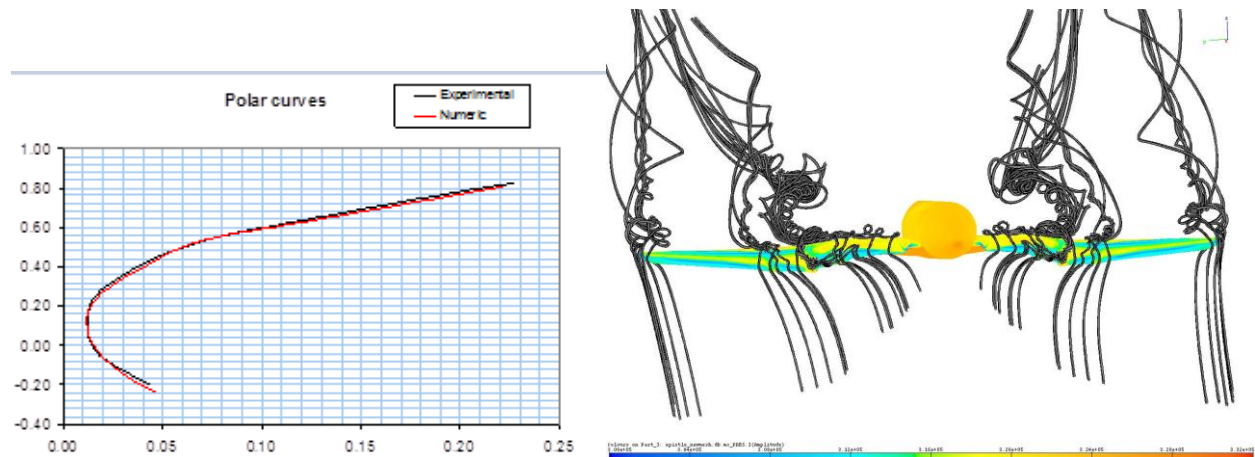


Figure: High lift inducing vortical flow patterns of morphing leading edges of high speed aircraft concepts, Comparison with wind tunnel results, HISAC project

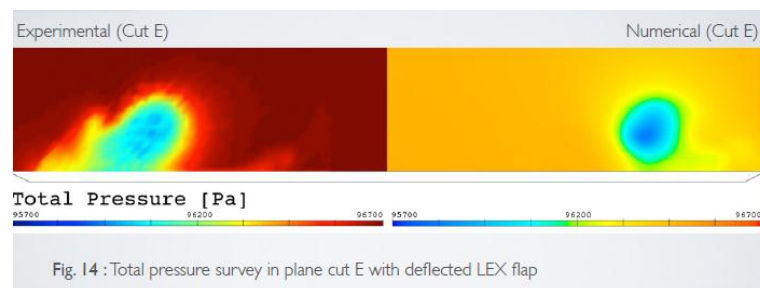


Fig. 14 : Total pressure survey in plane cut E with deflected LEX flap

Figure: Total pressure experimental / numerical global agreement for vortices over a LE deflected flap over a high speed wing of a fighter aircraft (experimental results courtesy of ETHZ)