# Advanced Aerodynamic Analysis of the NASA High-Lift Trap Wing with a Moving Flap Configuration

Presented by, Matt Hieatt of Flow HD at OED2016

XFlow is a CFD software package specifically designed to simulate complex systems with highly transient flows and the presence of moving parts. These two areas have traditionally proven to be difficult to treat with classical CFD solvers and this is why GRM have chosen to support our Engineering Services customers with XFlow.

XFlow requires no meshing, is inherently transient and compressible and has the capability to solve large eddy simulations to resolution of the grid. Using this method also allows the user to dynamically increase the resolution to capture turbulence and automatically detect geometry and apply an advanced wall model (fixed or moving). All while minimalizing model setup time, resulting accurate results faster.
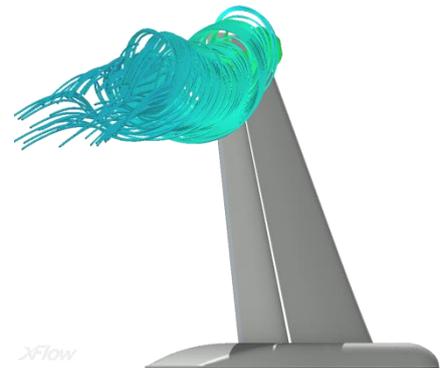
Lattice-Boltzmann Method

 "The kinetic theory of gases is a physical theory that explains the macroscopic behaviour and properties of gases from a statistical description of the microscopic molecular processes"
(L. Boltzmann, J.C Maxwell, s. XIX)
X-Flow solves the Boltzman equation across an octagonal grid, the fluid is represented as particle distribution functions of linear momentum and density.

High Lift Prediction Workshop1 (HiLiftPW-1)

In order to test commercial CFD packages, this test was created by The American Institute of Aeronautics and Astronautics (AIAA), which is the world's largest technical society dedicated to the global aerospace profession. This workshop provides a reference benchmark for the aeronautical industry to test CFD software, of which XFlow shows a very good correlation.

 XFlow has been proved as a reliable tool for traditional and advanced aerodynamic problems involving moving parts and polar sweep simulations. Many complex problems can be undertaken which most other CFD software would struggle to simulate. XFlow reduces the need to test designs in wind tunnels with the ability to give detailed surface results far beyond what is achievable via testing at a fraction of the cost.
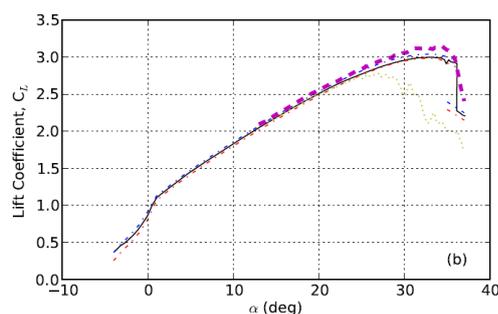
Summary

In this presentation Matt showed that XFlow offers users very advanced simulation techniques with minimal setup times. Results for the first HiLiftPW-1 was in a good agreement with the experimental data, validating XFlow as a CFD tool. XFlow has been proved as a reliable tool for traditional and advanced aerodynamic problems involving presence of moving parts and a successful polar sweep simulation.

(View full presentation here).