

The wing-tip vortex test case.

Jean-Eloi Lombard*, David Moxey, Spencer Sherwin

Imperial College
Exhibition Road, SW7 2AZ, London, United Kingdom
jean-eloi.lombard12@imperial.ac.uk

ABSTRACT

We present a spectral/hp element discretisation, using the Nektar++ [1] code, for performing a Large Eddy Simulation (LES) of the formation and evolution of a wingtip vortex as a test case involving a 3D geometry. The development of these vortices in the near wake, in combination with the large Reynolds numbers, make this test case particularly challenging to simulate. We consider flow over a NACA 0012 profile wingtip at 1.2 million Reynolds number, based on chord length [2] and compare them against experimental data [3], which is to date the highest Reynolds number achieved for a LES that has been correlated with experiments for this test case. The jetting of the primary vortex and pressure distribution on the wing surface in our model were successfully correlated with the experiment however the vortex formation over the rear wing tip has some discrepancies which lead act as a motivator for further testing of high-fidelity methods in this test case. The formation of the wingtip vortex test case is of general interest for the modeling of transitioning vortex dominated flows over complex geometries which is of particular interest to industries such as high-lift configurations in aircraft, wind-turbine or propeller and automotive design.

References

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