Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

LES of an Advancing Helicopter Rotor, and Near to Far Wake Assessment[1] DENIS-GABRIEL CAPRACE, MATTHIEU DUPONCHEEL, PHILIPPE CHATELAIN, GRGOIRE WINCKELMANS, Universit catholique de Louvain — Helicopter wake physics involve complex, unsteady vortical flows which have been only scarcely addressed in past studies. The present work focuses on LES of the wake flow behind an advancing rotor, to support the investigation of rotorcraft wake physics and decay mechanisms.A hybrid Vortex Particle-Mesh (VPM) method is employed to simulate the wake of an articulated four-bladed rotor in trimmed conditions, at an advance ratio of 0.41. The simulation domain extends to 30 rotor diameters downstream. The coarse scale aerodynamics of the blades are accounted for through enhanced immersed lifting lines. The vorticity generation mechanisms, the roll-up of the near wake and the resulting established far wake are described (i) qualitatively in terms of vortex dynamics using rotor polar plots and 3D visualizations; (ii) quantitatively using classical integral diagnostics. The power spectra measured by velocity probes in the wake are also presented. The analysis shows that the wake reaches a fully turbulent equilibrium state at a distance of about 30 diameters downstream.

[1]This work is supported by the Belgian french community F.R.S.-FNRS.

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Date submitted: 30 Jul 2017 Electronic form version 1.4