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**Aircraft wake two-vortex system at turbulent equilibrium** GREGOIRE WINCKELMANS, IVAN DE VISSCHER, Universite catholique de Louvain (UCL), Institute of Mechanics, Materials and Civil Engineering (iMMC), LAURENT BRICTEUX, University of Mons (UMons), Fluids and Machines Dept. — We consider a two-vortex system (2VS) started from a 2-D initial condition of given energy (two opposite sign vortices, each with an algebraic circulation profile and with a relatively tight core, $r_c$, compared to the distance, $b_0$, center to center: $r_c/b_0 = 0.05$). The 2VS is submitted to a very weak and realistic atmospheric turbulence background (of energy $< 0.01$ that of the 2VS) so that it is excited to go unstable. The flow then generates, by non-linear interactions, instabilities and much more turbulence and eventually reaches a statistical equilibrium: a 2VS still with tight cores, with significant turbulence in the vortex oval, yet still laminar in the inner part of the cores, and which slowly decays in time. This state of equilibrium is quite universal (as confirmed by various sensitivity analyses). It is then of great importance to the physics and modeling of fully formed aircraft wake vortices and is characterized: spectrum, vorticity field, circulation profile and core size of the vortices in cross-planes and for the mean (i.e., longitudinal average). The two-scales Proctor-Winckelmans profile model is also compared to the data: it fits well the inner part $0 < r/b_0 < 0.04$ and the outer part $0.16 < r/b_0 < 0.5$ of the profile, but is still poor in between.

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