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Two-dimensional linear instability of a Lamb-Oseen counter-rotating vortex dipole REMI JUGIER, LAURENT JOLY, JEROME FONTANE, Universite de Toulouse, ISAE, DAEP, PIERRE BRANCHER, Universite de Toulouse, UPS-IMFT — The present study investigates the stability of a family of quasi-steady two-dimensional vortex dipoles resulting from the adaptation to the mutual deformation and viscous diffusion of counter-rotating Lamb-Oseen vortices of equal size and circulation. For sufficiently large Reynolds numbers, the internal structure is set by the dipole aspect ratio a/b (radius versus separation distance), giving rise to a family of smooth quasi-steady solutions. These base flow solutions consist of self-propagating dipoles with a vorticity trail leaking from the dipole during the self-adaptation process and from diffusion across the dipole Kelvin oval. The present work is a generalization of the recent study by Brion *et al.* (Phys. Fluids 2014), who found that a specific kind of vortex dipole, the Lamb-Chaplygin dipole, was unstable with respect to two-dimensionnal perturbations. We show how the growth rate and spatial structure of the unstable modes vary with aspect ratio a/b and Reynolds number. The growth rates are lower than for the Lamb-Chaplygin dipole and decreases when the aspect ratio is lowered. It is advocated here that these new two-dimensional modes of small aspect-ratio smooth dipoles are good candidates for steady actuation in aircrafts conditions.

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