Flying, swimming and fluttering in 3D: potential flow around a rectangular deformable plate[1] CHRISTOPHE ELOY, LIONEL SCHOU-VEILER, IRPHE, Marseille, France — The interaction between a flexible rectangular plate and the flow around it can serve as a model for several phenomena. This situation arises in many problems of animal locomotion as well as industrial ones such as airfoil flutter. So far, most models have assumed a 2D problem for the sake of simplicity. We show here how to extend these models to include the finite plate aspect ratio in the analysis. We consider a rectangular deformable plate moving in a uniform flow at small amplitude such that the plate and its wake remain in the same plane at first order. The potential flow around the plate is calculated in the Fourier space and then averaged along the span. The result is a new integral equation for the vorticity distribution both inside the solid plate and in its wake. It means that the 3D effects can be taken into account by simply modifying the potential of a point-vortex (or equivalently the Green function of the Laplace's equation).

Christophe Eloy
IRPHE, Marseille, France

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