

ACOUSTICS2008/1078
Noise generation in an unstable boundary-layer flow over a flexible wall

Marie-Laure Gobert^{a,b}, Uwe Ehrenstein^c, Jacques Andre Astolfi^a, Patrick Bot^a, Jean Audet^b and Guillaume Oudot^d

^aIRENav, BP 600, 29240 Brest Armées, France

^bThales Underwater Systems, 525 route des Dolines, BP 157, 06903 Sophia Antipolis, France

^cIRPHE, 49 rue Joliot-Curie, BP 146, 13384 Marseille Cedex 13, France

^dDCNS Divison Navires Armés, Le Mourillon, BP 1306, 83076 Toulon cedex, France

The boundary-layer flow, for instance along a sonar dome, gives rise to hydrodynamic noise due to the pressure fluctuations. The prediction of the resulting self-noise received by the sonar antenna is based on models, which in general take only partially into account the flexibility of the dome wall. The present work readdresses the problem of hydrodynamic noise, considering the geometrically simplified model of a two-dimensional unstable boundary-layer flow along an elastic plate with clamped ends. The incompressible Navier-Stokes equations are fully coupled to the elastic plate model and the system is numerically solved for various plate materials. The unstable flow dynamics is analyzed with respect to the wall properties. The Fourier-transformed stress tensor is then used in the framework of Lighthill's analogy to determine the generated radiative sound, emphasizing the effect of wall-flexibility. This work is supported by Thales Underwater System and DCNS.