

ACOUSTICS2008/2338
**Structural Health Monitoring using cross-correlation of an
ambient noise field**

Najib Abou Leyla^a, Emmanuel Moulin^b, Jamal Assaad^b, Sébastien Grondel^b and Pascal Poussot^a

^aUVHC, IEMN-DOAE, Le Mont Houy, 59313 Valenciennes, France

^bUVHC, IEMN-DOAE, Le Mont-Houy, 59313 Valenciennes, France

Theoretical and experimental studies in underwater acoustic, seismology and more recently ultrasonic have demonstrated that an estimate of the Time Domain Green Function (TDGF) between two receivers could be obtained from the cross-correlation of a diffuse acoustic noise field of these two receivers. The aim of the work is to exploit this technique in order to characterize Structural Health Monitoring (SHM) of aeronautic structures without the use of active sources. In this case, the aero-acoustic and/or mechanical sources (engine) generate an ambient noise field with some imperfections for the application. Indeed, source concentrations, source directivity and non-random components in time can appear which leads to an erroneous estimate of the TDGF. A key point to the study is thus to understand the influence of such imperfections. Therefore, experimental measurements have been performed using different types of acoustic noise sources (localized or diffuse). Cross-correlation results obtained in each case are then compared and theoretically interpreted. Finally, the potential of this technique in terms of damage detection is verified.