Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Three-dimensional instabilities of compressible flow over open cavities[1] GUILLAUME BRES, TIM COLONIUS, California Institute of Technology, VASSILIOS THEOFILIS COLLABORATION[2] — We developed a three-dimensional algorithm for direct numerical simulations (DNS) of open cavity flow to extend a previous study of cavity oscillations (JFM 455:325-346, 2002). Complementary methodologies for extracting information about global instabilities (including their receptivity and optimal control) of two- and three-dimensional cavity flows have been implemented. For a low Mach number cavity with length-to-depth ratio of two, the two-dimensional steady flow was found unstable to three-dimensional (spanwise homogeneous) disturbances that consist of a spanwise modulation of the recirculating vortex interior to the cavity. The oscillations are unstable over a narrow band of spanwise wavelengths comparable to the cavity depth, and oscillatory in time, but with a very low frequency (about 10 times lower than the two-dimensional Rossiter mode). Results from simulations for different cavity aspect ratios and Mach numbers will also be presented.

[1]Supported by AFOSR grant F49620-02-1-0362
[2]Universidad Politecnica de Madrid

Guillaume Bres
California Institute of Technology

Date submitted: 11 Aug 2005 Electronic form version 1.4