DES Validations of Cavity Acoustics over the Subsonic to Supersonic Range

The present work follows on from a successful validation study into the use of 3D CFD with advanced turbulence modeling to predict narrowband and broadband flow noise in a rectangular cavity (L/D=5,W/D=1) at M=0.85. In the present study, this body of work is extended in three ways: first, from the transonic case to a range of flow speeds, from subsonic through to supersonic, M=0.6 to 1.35. Secondly, comparison is made between three DES variants; two of which are frequently referenced in the literature, namely Spalart-Allmaras and k-?-SST, and our own variant based on the standard k-? model as used in the previous work. Thirdly, we reduce uncertainties due to mesh and discretisation scheme dependence by comparing results from coarse and fine meshes, and blended discretisation schemes. The Mach number sweep predictions are then compared with the M219 cavity measured point spectra along the cavity ceiling, and RMS pressure along its length. The results are in good agreement with the measurements.

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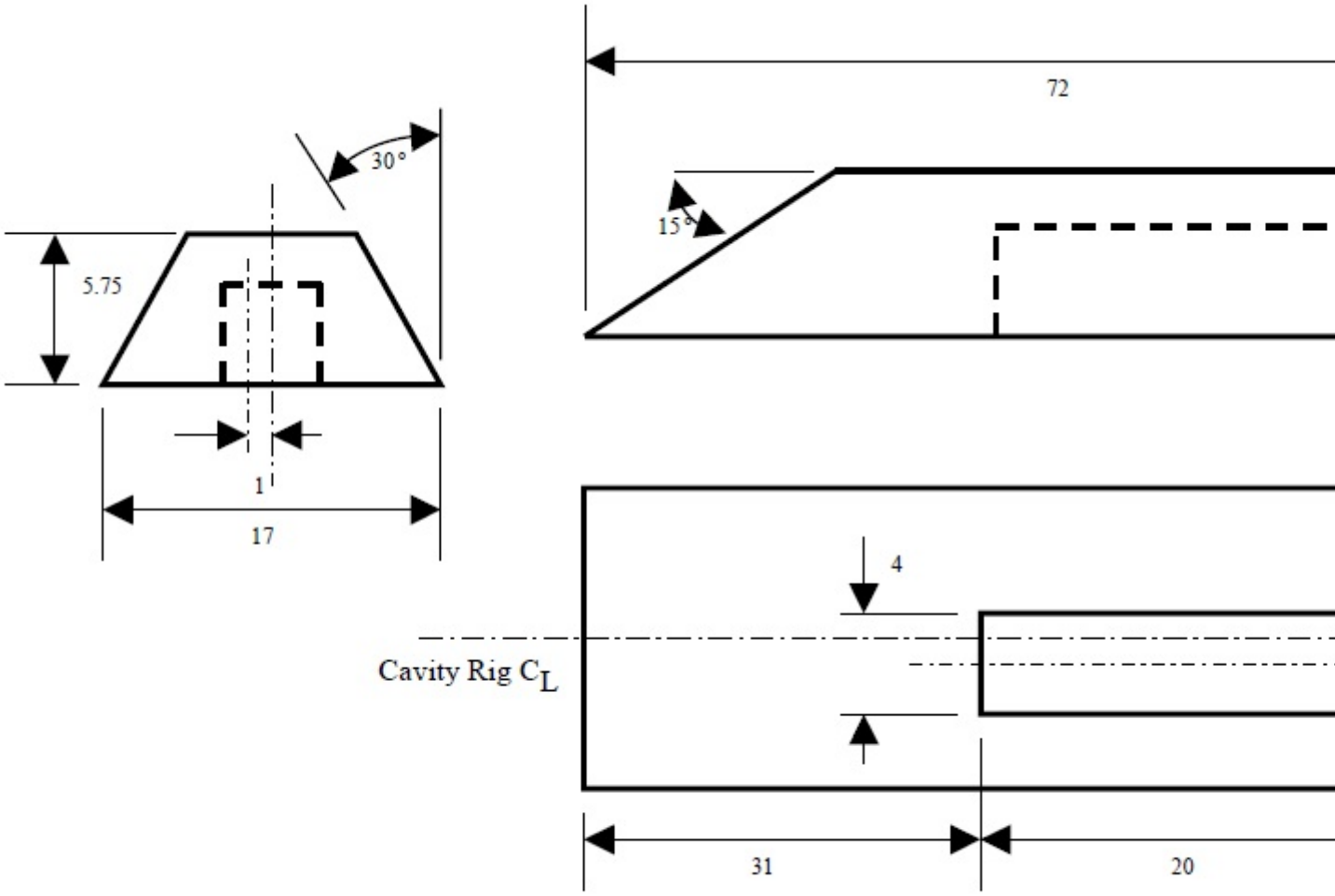

Figure 1. Experimental rig schematic of the M219 4in. cavity model (dimen

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