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Dynamic mode decomposition of supersonic and transonic wakes of generic space launcher configurations VLADIMIR STATNIKOV, Institute of Aerodynamics and Chair of Fluid Mechanics, RWTH Aachen University, TARANEH SAYADI, Laboratoire d'Hydrodynamique, Ecole Polytechnique, France, MATTHIAS MEINKE, WOLFGANG SCHROEDER, Institute of Aerodynamics and Chair of Fluid Mechanics, RWTH Aachen University, PETER SCHMID, Laboratoire d'Hydrodynamique, Ecole Polytechnique, France — Dynamic mode decomposition (DMD) is applied to supersonic and transonic wakes of generic space launcher configurations of Mach numbers 0.7 and 6 computed using a zonal RANS/LES approach. The axisymmetric geometry includes a backward facing step that causes the flow to separate. In addition to the separation bubble, acoustic waves are also radiated from the downstream region of the flow. Experimental and numerical observations clearly demonstrate the existence of peaks in the pressure spectra which can be attributed to both the flow inside the wake and the acoustic waves in the freestream. The objective of this work is to apply DMD to the set of numerical data in order to firstly, extract the spatial shape of the modes and secondly, identify their respective frequencies. This allows the dynamics associated to the separation bubble and those of the acoustic waves to be differentiated properly. In addition, with the help of DMD the modes responsible for pressure-loading on the backward face of the step are extracted and analyzed.

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