Secondary instability of laminar separation bubbles in the absence of external disturbances[1] DANIEL RODRIGUEZ, Pontificia Universidade Catolica de Rio de Janeiro (PUC-Rio), ELMER GENNARO, UNESP - Universidade Estadual Paulista, LEANDRO SOUZA, Universidade de Sao Paulo —

Previous studies demonstrate that the primary instability of laminar separation bubbles (LSB) on a flat-plate in the absence of external forcing is a three-dimensional centrifugal one. This work develops a weakly non-linear expansion of the associated symmetry-breaking bifurcation, showing that it corresponds to a supercritical pitchfork bifurcation. The secondary instability of the fully 3D bifurcated LSB is then investigated by means of the temporal instability of 3D global modes, computed either as solutions of a 3D (Tri-global) eigenvalue problem, or based on a WKB approximation and the existence of local regions of absolute instability of the cross-stream planes. Both methodologies recover an amplified global oscillator, originated by the spanwise velocity gradients, that can explain the origin of the unsteadiness observed in numerical simulations of unforced LSBs with peak reversed flows below 15%, as the results of a secondary instability of the 3D separation bubble.

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