Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Stability and dynamics of a stack of flags. HYEONSEONG KIM, DAEGYOUM KIM, KAIST — We theoretically and experimentally study stability for two configurations of flags in a stack: conventional flags with their leading edge clamped and trailing edge free to move and inverted flags with the opposite configuration. In this study, we propose a scaled critical velocity which accounts for the variation of flag thickness, aspect ratio, and the number of flags in a stack. The effects of these parameters on the stability predicted by our theoretical model are in good agreement with our experimental measurements. After bifurcation to a non-linear regime, while the conventional flags directly show in-phase second-mode oscillation in a stacked mode. However, when the free-stream velocity further increases and reaches to a certain value, the inverted flags show a large-amplitude flapping motion in a stack state. In the stacked inverted flags, novel non-linear behaviors such as symmetric clapping motion are also observed in some specific conditions.

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Date submitted: 31 Jul 2017 Electronic form version 1.4