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Stability of a falling bio-inspired bristled disk MINHYEONG LEE, SEUNG HUN LEE, DAEGYOUM KIM, KAIST — Unlike most flying insects whose wings are covered by membranes, some of the smallest flying insects, Thysanoptera and Mymaridae, have wings that consist of bristles attached to a central frame. Due to their microscopic size, the smallest flying insects live in a very low-Reynolds-number regime of the order of 10 or less. Previous researches on the bristled wing have focused on finding the effects of the gaps on aerodynamic performance under various kinematics of the wing. Interestingly, tiny insects possessing the bristled wings have been reported to perform parachuting, one of passive flight modes. However, the dynamics of the bristled wing during parachuting and their effects on stability have not been studied yet. In this study, we examine the stability of a freely falling bristled disk experimentally in the low-Reynolds-number regime by changing the number of bristles and an initial falling orientation and compare with those of a full circular disk without bristles. Our experiments show that a full disk undergoes large disturbance in its orientation and displacement at the initial transient phase of free fall while a bristled disk shows more stable motion explicitly.

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