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# Experimental study on dependence of streak breakdown on disturbance nature

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**Abstract**

Instability and breakdown of a low-speed streak initially forced by disturbances with a frequency-spectrum similar to that of wall turbulence were examined experimentally. A single low-speed streak was generated using a small piece of screen set normal to a boundary-layer plate, and disturbances made by two loudspeakers were introduced through two small holes. Turbulent velocity fluctuations with various spanwise coherences were used as driving signals to two loudspeakers to see how strongly the streak breakdown depended on the nature of disturbances. Signals were deduced at two spanwise locations with distance $\Delta z^+ = 24$ – 149 in the buffer region of a turbulent boundary layer by using a pair of hot-wires. The correlation coefficient $C_t$ of the two turbulent signals ranged from -0.11 to 0.56. Both sinuous and varicose modes were excited but the former became dominant downstream in all cases. Development of the disturbance excited was compared to those for anti-symmetric ($C_t$ = -1) and symmetric ($C_t$ = 1) excitations with the same turbulent spectrum. The comparison showed that the magnitude of the sinuous instability mode excited was dependent on the initial disturbances, but not strongly for $-1 \leq C_t \leq 0$. That is, in terms of the rms value of velocity fluctuations, the magnitude of the sinuous instability mode for the initial disturbance with $C_t \sim 0$ was about 75% of that in the case of anti-symmetric forcing. Even for $C_t \sim +0.56$, the magnitude of the sinuous mode excited was as large as 50% of that in the anti-symmetric case.

*Keywords:* low speed streak, instability, streak breakdown, wall turbulence

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