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Secondary Instability of Stationary Vortex Packets in a Swept Wing Boundary Layer

Valery G. Chernoray[(1)], Alexander V. Dovgal[(2)], **Victor V. Kozlov**[(2)], Lennart Loefdahl[(1)]

(1) *Thermo and Fluid Dynamics, Chalmers University of Technology, Goteborg, Sweden*
(2) *Institute of Theoretical and Applied Mechanics, 630090 Novosibirsk, Russia*

The presentation is focusing on the coherent features of a swept wing boundary layer. The three-dimensional flow of a swept wing is highly unstable with respect to longitudinal streamwise vortices, which, in turn, are subject to the secondary instabilities. The fact is that stationary vortex packets are most likely to be generated under natural flight conditions on the wing and these disturbances lead to breakdown the fastest. A detailed experimental study on the formation of crossflow vortex mode packets and their secondary instability in a swept wing boundary layer was carried out. Different methods of controlled excitation are used so that the crossflow vortex packets are generated by surface roughness elements and by localized continuous suction. The secondary instabilities investigated were those originated ‘naturally’ and forced in a controlled manner. Therefore, the characteristics of secondary instability obtained include phase information, growth rates and the development of nonlinear harmonics.

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