

9.1.4	Conclusions	413
9.2	Breakdown of Two-Dimensional Waves	414
9.2.1	The Zero Pressure Gradient Boundary Layer	414
9.2.2	Breakdown of Mixing Layers	420
9.3	Streak Breakdown	425
9.3.1	Streaks Forced by Blowing or Suction	425
9.3.2	Freestream Turbulence	429
9.4	Oblique Transition	436
9.4.1	Experiments and Simulations in Blasius Flow	436
9.4.2	Transition in a Separation Bubble	441
9.4.3	Compressible Oblique Transition	445
9.5	Transition of Vortex-Dominated Flows	446
9.5.1	Transition in Flows with Curvature	446
9.5.2	Direct Numerical Simulations of Secondary Instability of Crossflow Vortices	450
9.5.3	Experimental Investigations of Breakdown of Crossflow Vortices	455
9.6	Breakdown of Localized Disturbances	456
9.6.1	Experimental Results for Boundary Layers	459
9.6.2	Direct Numerical Simulations in Boundary Layers .	460
9.7	Transition Modeling	465
9.7.1	Low-Dimensional Models of Subcritical Transition .	465
9.7.2	Traditional Transition Prediction Models	469
9.7.3	Transition Prediction Models Based on Nonmodal Growth	471
9.7.4	Nonlinear Transition Modeling	474

III Appendix

A	Numerical Issues and Computer Programs	479
A.1	Global versus Local Methods	479
A.2	Runge-Kutta Methods	480
A.3	Chebyshev Expansions	483
A.4	Infinite Domain and Continuous Spectrum	486
A.5	Chebyshev Discretization of the Orr-Sommerfeld Equation .	487
A.6	MATLAB Codes for Hydrodynamic Stability Calculations .	489
A.7	Eigenvalues of Parallel Shear Flows	503
B	Resonances and Degeneracies	509
B.1	Resonances and Degeneracies	509
B.2	Orr-Sommerfeld-Squire Resonance	511