

Some References for Laminar-Turbulent Transition

There is no good monograph introducing and reviewing the whole area. There have been a few attempts, none very recently. My paper database contains more than 3800 papers with keywords of ‘stability’ or ‘transition’. This is the accumulation of almost three decades.

1. *Viscous Fluid Flow, 3rd edition*, F.M. White, McGraw-Hill, 2006. Good introduction and fairly recent references.
2. *Hydrodynamic and Hydromagnetic Stability*, S. Chandrasekhar, Dover, 1961/1990. Strong on classic linear theory, thermal instabilities. Weaker for shear flow instability. Cheap, still in print.
3. *Stability of Parallel Flow*, Betchov and Criminale, Academic Press, 1967. Standard monograph on instability theory for boundary and shear layers. Introduced computer methods. A standard reference, with good but hard-to-follow physical intuition. Out of print now. See also *Theory and Computation of Hydrodynamic Instability*, by Criminale, Jackson, and Joslin, Cambridge Univ. Press, 2003. Nearly all theory and computation.
4. *Hydrodynamic Stability*, Drazin and Reid, Cambridge, 1981. Strong on asymptotic methods for shear flows, including nonparallel effects. Paperback is not expensive. Very much oriented to mathematics, although still readable. (Note re Fig. 4.30, comparison to non-parallel flow theory of Saric and Nayfeh: this nonparallel flow theory has errors and is wrong - see papers from 1989 Laminar-Turbulent Transition meeting). See 2nd edition, 2004, and *Introduction to Hydrodynamic Stability*, 2002.
5. ‘Spatial and Temporal Stability Charts for the Falkner-Skan Boundary Layer Profiles’, Wazzan, Okamura, and Smith, 1968, Douglas Aircraft Company Report DAC-67086. Data from Orr-Sommerfeld computations for Falkner-Skan beta’s ranging from 1.0 to -0.1988. The most complete compendium available in report form.

6. AGARD reports: AGARDograph 134, *A Portfolio of Stability Characteristics of Incompressible Boundary Layers*, by Obremski, Morkovin, and Landahl, 1969; CP-551, *Application of Direct and Large Eddy Simulation to Transition and Turbulence*, 1994; Report 709, *Special Course on Stability and Transition of Laminar Flow*, 1984; Report 793, *Special Course on Progress in Transition Modelling*, 1993; CP-224, 1977; there are many others.
7. IUTAM Symposia on Laminar-Turbulent Transition; Stuttgart ca. 1979, Novosibirsk 1984, Toulouse 1989, Sendai 1994, Sedona 1999, Bangalore, 2004, Stockholm, 2009. Rio de Janeiro, 2014. These are held every five years; the proceedings are published by Springer-Verlag. Contain a wide variety of papers on transition by well-known authors. The 2014 proceedings have not yet been published, it seems
8. *Stability and Transition in Shear Flows*, by Schmid and Henningson, Springer-Verlag, 2001. This is a fairly new book. It has a good discussion of transient-growth theory, but does not cover the experimental literature. See also Schmid's later review of transient-growth theory in *Annual Reviews of Fluid Mechanics*, v. 39, 2007.
9. *Stability and Transition: Theory and Application*, by Tuncer Cebeci, Springer-Verlag, 2004. This is a fairly new book, which mainly covers the background and usage for several stability-based computer codes for predicting the onset of transition. The book is particularly valuable since it includes a CD-ROM with the FORTRAN source code for the mean-flow and stability analyses (for wings and 2D flows). The code is a likely beginning for course projects; if you are interested in such a project you might want to purchase the book. There are several other related books by the same author that may also be helpful.
10. Survey papers, mainly in *Annual Reviews of Fluid Mechanics*, *Progress in Aerospace Sciences*, and *Applied Mechanics Reviews*. A few of these are listed as follows, there are many others.

11. 'Laminar-turbulent transition prediction in three-dimensional flows', D. Arnal, G. Casalis, Prog. Aero. Sci, vol. 36, pp. 173-191, 2000. Nice review of the subsonic case focusing on swept wings. Good regarding the issues of how to follow wave growth in 3D, with both streamwise and crossflow instabilities, inconsistent N factors in 3D, list of open questions.
12. 'Automatic transition prediction using simplified methods', J. Perraud, D. Arnal, G. Casalis, J. Archambaud, R. Donelli, AIAA J. v. 47, n. 11, pp. 2676-2684, 2009. Nice summary of approximate methods for design, from the European perspective.
13. 'Flight Test Measurement Techniques for Laminar Flow', NATO RTO Agardograph 300, vol. 23, ed. by Fisher et al, 2003. Nice summary of all the lower-speed laminar-flow flight tests and the experimental methods they used.
14. 'Transition and Stability of High-Speed Boundary Layers', A. Fedorov, Ann. Rev. of Fluid Mechanics, v. 43, pp. 79-98, 2011. Good overview of theoretical issues.
15. 'Global Linear Instability', V. Theofilis, Ann. Rev. of Fluid Mechanics, v. 43, pp. 319-352, 2011. Methods for analyzing strongly three-dimensional mean flows.
16. *Instabilities of Flows and Transition to Turbulence*, Tapan K. Sengupta, CRC Press, 2012. This new book covers a wide range of incompressible topics. It seems to have a theoretical and computational perspective.