

# Contents

## 1 WALL-BOUNDED FLOWS

### 1A STRUCTURE

|                                                                                                                                                    |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------|----|
| H.M. Nagib, C.E. Wark, Y.G. Guezennec: Documentation of turbulence producing structures in regular and manipulated turbulent boundary layers .. .. | 3  |
| J.H. Arakeri, D.E. Coles: Measurements in a synthetic turbulent boundary layer .. ..                                                               | 23 |
| K.R. Sreenivasan: A unified view of the origin and morphology of the turbulent boundary layer structure .. ..                                      | 37 |

### 1B OUTER LAYER DEVICES

|                                                                                                               |    |
|---------------------------------------------------------------------------------------------------------------|----|
| K.S. Yajnik, S. Sundaram, R. Sivaram: Evaluation of drag reduction by turbulence control devices .. ..        | 63 |
| A.M. Savill: Turbulent boundary layer manipulation and modelling in zero and adverse pressure gradients .. .. | 69 |
| A. Bertelrud: Computational and experimental studies of LEBUS at high device Reynolds numbers .. ..           | 85 |
| A. Prabhu, P. Kailas Nath, R.S. Kulkarni, R. Narasimha: Blade manipulators in channel flow .. ..              | 97 |

### 1C SURFACE MANIPULATION

|                                                                                                                                                                             |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| A. Dinkelacker, P. Nitschke-Kowsky, W.-E. Reif: On the possibility of drag reduction with the help of longitudinal ridges in the walls .. ..                                | 109 |
| S.P. Wilkinson, B.S. Lazos: Direct drag and hot-wire measurements on thin-element riblet arrays .. ..                                                                       | 121 |
| J.M. Wallace, J.-L. Balint: Viscous drag reduction using streamwise aligned riblets: survey and new results .. ..                                                           | 133 |
| Kwing-So Choi: The wall pressure fluctuations of modified turbulent boundary layer with riblets .. ..                                                                       | 149 |
| I. Tani, H. Munakata, A. Matsumoto, K. Abe: Turbulence management by groove roughness .. ..                                                                                 | 161 |
| T.K. Sengupta, G.K. Suryanarayana, S. Selvarajan: A case for turbulence management by imposed wall excitation for fully developed turbulent flows - a numerical study .. .. | 173 |

2      TRANSITION2A    DYNAMICS

|                                                                                                                                         |     |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----|
| H.F. Robey: The nature of oblique instability waves in boundary layer transition .. ..                                                  | 187 |
| T.C. Corke, R.A. Mangano: Transition of a boundary layer: controlled fundamental-subharmonic interactions ..                            | 199 |
| Y. Kohama: Three-dimensional boundary-layer transition on a concave-convex curved wall .. ..                                            | 215 |
| K.S. Yang, P.R. Spalart, H.L. Reed, J.H. Ferziger: Numerical simulation of transition in a decelerating boundary layer .. ..            | 227 |
| Ch.P. Ritz, R.W. Miksad, E.J. Powers, F.L. Jones, R.S. Solis: Measurement of nonlinear transfer functions for transitioning flows .. .. | 239 |

2B    CONTROL

|                                                                                                          |     |
|----------------------------------------------------------------------------------------------------------|-----|
| V.V. Kozlov, Y.Ya. Levchenko: Laminar-turbulent transition control by localized disturbances .. ..       | 249 |
| A.I. Derzhavina, O.S. Ryzhov, E.D. Terentev: Suppression of unstable oscillations in a boundary layer .. | 271 |
| M. Gaster: Is the dolphin a red herring? .. ..                                                           | 285 |
| P.W. Carpenter: The optimization of compliant surfaces for transition delay .. ..                        | 305 |

3      RELAMINARISATION, NATURAL LAMINAR FLOW

|                                                                                                                                                              |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| P.R. Viswanath, A. Prabhu, G.S. Bhat: Visualization of relaminarising flows: a colour movie .. ..                                                            | 317 |
| M. Tabatabai, A. Pollard: On the process of inverse transition in radial flow between parallel disks ..                                                      | 319 |
| H.-W. Bewersdorff, R.P. Singh: Turbulent drag reduction and relaminarisation by xanthan gum .. ..                                                            | 333 |
| W. Pfenninger, J. Viken, C.S. Vemuru, G. Volpe: All laminar supercritical LFC airfoils with natural laminar flow in the region of the main wing structure .. | 349 |

#### 4 FREE SHEAR FLOWS

|                                                                                                                                      |    |    |     |
|--------------------------------------------------------------------------------------------------------------------------------------|----|----|-----|
| I. Wygnanski, I. Weisbrot: On the pairing process in an excited, plane, turbulent mixing layer                                       | .. | .. | 409 |
| R.J. Hakkinen, J.T. Kegelman, V. Kibens, F.W. Roos, R.W. Wlezien: Experiments on turbulence control in jets and shear flows          | .. | .. | 423 |
| R.A. Petersen, M.M. Samet, T.A. Long: Excitation of azimuthal modes in an axisymmetric jet                                           | .. | .. | 435 |
| A.K.M.F. Hussain, H.S. Husain: Passive and active control of jet turbulence                                                          | .. | .. | 445 |
| R.E. Breidenthal: Turbulent mixing in accelerating jets                                                                              |    |    | 459 |
| M.A. Badri Narayanan, M.F. Platzer: The mixing mechanism by organised turbulence structures in a plane jet excited by a novel method | .. | .. | 471 |
| T. Srinivas, B. Vasudevan, A. Prabhu: Performance of fluidically controlled oscillating jet                                          | .. | .. | 485 |

#### 5 SEPARATED FLOWS

|                                                                                      |    |    |     |
|--------------------------------------------------------------------------------------|----|----|-----|
| L.W. Sigurdson, A. Roshko: The structure and control of a turbulent reattaching flow | .. | .. | 497 |
| C. Shih, M. Lee, C.-M. Ho: Control of separated flow on a symmetric airfoil          | .. | .. | 515 |