

Contents

KEYNOTE LECTURES

Chairman: M. Gaster

Turbulence in the Turn of the Century.....3
T. Tatsumi

Early History of Compressible Linear Stability Theory.....9
LM. Mack

SESSION A: RECEPTIVITY I

Chairman: V. Kozlov

Effect of Leading-Edge Geometry and Aerodynamic Loading on
Receptivity to Acoustic Disturbances.....37
P.W. Hammerton, E.J. Kersehen

Acoustic Receptivity in Boundary Layers with Surface Roughness 43
LM. Cullen, H.P. Horton

A Causal Stability Analysis of the Boundary Layer Over a
Compliant Wall.....51
N. Peake, R.J. Lingwood

Non-Parallel Receptivity and the Adjoint PSE.....57
C. Airiau, S. Walther, A. Bottaro

SESSION B: RECEPTIVITY II

Chairman: V. Levchenko

Three-Dimensional Receptivity of Boundary Layers to External
Perturbations.....65
Y.S. Kachanov

Boundary Layer Receptivity to Free-Stream Sound on Elliptic
Leading Edges of Flat Plates.....71
J.B.V. Wanderley, T.C. Corke

Non-Localized Acoustic Receptivity and Subsequent Disturbance Growth in a Blasius Boundary Layer.....	79
<i>R.A. King, K.S. Breuer</i>	
Receptivity and Bypass Dynamics.....	85
<i>D.G. Lasseigne, W.O. Criminale, R.D. Joslin, T.L Jackson</i>	
Study of 3D Wall Roughness Acoustic Receptivity on an Airfoil.....	91
<i>W. Würz, S. Herr, A. Wörner, U. Rist, S. Wagner, Y.S. Kachanov</i>	
Experiments on Receptivity, Stability, and Transition of 2-D Laminar Boundary Layers with Streamwise Pressure Gradients.....	97
<i>V.S. Kosorygin</i>	
Leading-Edge Acoustic Receptivity Measurements Using a Pulsed-Sound Technique.....	103
<i>E.B. White, W.S. Saric, R.H. Radeztsky, Jr.</i>	
POSTER SESSION I	
Evaluation of Adjoint Based Methods for the Prediction of Receptivity.....	111
<i>S.S. Collis, A. Dobrinsky</i>	
Receptivity to Freestream Turbulence and the Effect of Longitudinal Vortices in Boundary Layer Transition.....	117
<i>Y.-C. Su, T. Herbert</i>	
Receptivity for a Fiat Plate with a Rounded Leading-Edge.....	125
<i>D.E. Nichols, P.W. Hammerton</i>	
Experiments on the Receptivity of a Boundary Layer to a Localized Free Stream Disturbance.....	131
<i>HR. Grek, W.W. Kozlov, D.S. Sboev</i>	
Experimental Study of Flat-Plate Boundary Layer Receptivity to Vorticity Normal to Leading Edge.....	137
<i>M.W. Ustinov, M.N. Kogan, W.G. Shumilkin, S.G. Zhigulev</i>	
Boundary Layer Longitudinal Localized Structures Control by Means of Spanwise Wall Oscillations.....	143
<i>MM. Katasonov, W. W. Kozlov</i>	
DNS of Active Control of Disturbances in a Blasius Boundary Layer.....	149
<i>C. Gmelin, U. Rist, S. Wagner</i>	

Active Control of TS-Instabilities on an Unswept Wing.....	155
<i>M. Baumann, D. Sturzebecher, W. Nitsche</i>	
Control of Streaky Structures by Localized Blowing and Suction.....	161
<i>A.A. Bakchinov, MM. Katasonov, P.H. Alfredsson, V. V. Kozlov</i>	
Late-Stage Transitional Boundary-Layer Structures. Direct Numerical Simulation and Experiment.....	167
<i>D.G.W. Meyer, U. Rist, V.I. Borodulin, V.R. Gaponenko, Y.S. Kachanov, Q.X. Lian, C.B. Lee</i>	
Experimental Study of a A-Structure Development and Mechanism: Its Transformation into the Turbulent Spot.....	173
<i>G.R. Grek, MM. Katasonov, V.V. Kozlov, V.G. Chernoray</i>	
Nonlinear Evolution of Tollmien-Schlichting Waves at Finite Reynolds Numbers.....	181
<i>S. Houten, J. Healey, C. Davies</i>	
On Why Oblique Waves in the Blasius Boundary Layer Show S tronger Nonparallel Effects than Planar Waves.....	187
<i>/./ Healey</i>	
Stability of Weakly Non-Similar Swept-Wing Boundary Layers.....	193
<i>R. Govindarajan, R. Narasimha</i>	
Boundary Layer Transition Due to the Entry of a Small Particle.....	199
<i>P.H. Taniguchi, F.K. Browand, R.F. Blackwelder</i>	
Turbulent Energy Production Mechanism in General Boundary Layer Transition.....	205
<i>Y.P. Kohama, P.H. Alfredsson, Y. Egami, M. Kawakami</i>	
Energy Transfer Analysis of Turbulent Plane Couette Flow.....	211
<i>S.C. Reddy, P.J. Ioannou</i>	
Nonlinear Initial Value Problems for Wave/Vortex Interactions in Channel Flows.....	+
<i>P. Hall</i>	
Numerical Investigation of Resonance Phenomena in Wall Jet Transition.....	217
<i>S. Wernz, H Fasel</i>	
Supersonic Boundary Layer Receptivity to Streamwise Acoustic Field.....	223
<i>S.A. Gaponov, B. V. Smorodsky</i>	

Feed-Forward Control of Streak Instabilities in Plane Poiseuille Flow by Localized Suction.....	229
<i>F. Lundell, P.H. Alfredsson</i>	

Effect of Suction Through Arrays of Holes on a 3-D Boundary Layer Investigated by Spatial Direct Numerical Simulation.....	235
<i>R. Messing, M. Kloker</i>	

SESSION C: ATTACHMENT LINE AND GENERAL TOPICS

Chairman: R. Kobayashi

Relaminarization and Retransition of Accelerated Turbulent Boundary Layers on a Convex Surface.....	243
<i>R. Mukund, P.R. Viswanath, J.D. Crouch</i>	

Effect of Wall Temperature on Roughness Induced Attachment- Line Transition.....	249
<i>A. Dietz, C. Coleman, J. Laub, D.I.A. Poll</i>	

On the Growth of Waves in Boundary Layers: A Simple Approximate Solution.....	255
<i>M. Gaster</i>	

SESSION D: 3-D TRANSITION IN 2-D FLOWS

Chairman: D. Arnal

The Formation of Secondary Structures and Random Perturbations in the Development of Periodic Lambda-Structures in a Laminar Boundary Layer.....	263
<i>S. Bake, H.-H. Fernholz</i>	

Instability and Breakdown of the Three-Dimensional High-Shear Layer Associated with a Near-Wall Low-Speed Streak.....	269
<i>M. Asai, M. Minagawa, M. Nishioka</i>	

On Vortex Interaction in the Latter Stages of Boundary-Layer Transition.....	275
<i>R.I. Bowles</i>	

The Evolution of Hairpin Vortices in Shear Flows.....	281
<i>E. Malkiel, V. Levinski, M. Rosenfeld, J. Cohen</i>	

Nonlinear Three Dimensional Wavetrains of Small Amplitude in Boundary Layers: Experiments, Theory and Computations.....	287
<i>M.A.F. de Medeiros, M.T. Mendonga</i>	

Stationary and Nonstationary Streaky Structures and Secondary Instability of Boundary Layers.....	293
<i>V.V. Kozlov, G.R. Grek</i>	

SESSION E: CONTROL

Chairman: R. Narasimha

Generation of Oblique Waves in a Blasius Boundary Layer by Thin Piezo-Film Actuators Attached to the Wall Surface.....	301
<i>Y. Fukunishi, I. Ebina, R. Kobayashi</i>	

Optimal Control by Blowing and Suction at the Wall of Algebraically Growing Boundary Layer Disturbances.....	307
<i>P. Cathalifaud, P. Luchini</i>	

A Novel Velocity-Vorticity Method for Simulating Boundary- Layer Disturbance Evolution and Control.....	313
<i>C. Davies, P. W. Carpenter, D.A. Lockerby</i>	

Optimal Three-Dimensional Perturbations in the Blasius Boundary Layer.....	+) 319
<i>P. Andersson, M. Berggren, D. Henningson</i>	

Optimal Control of Boundary Layers Under Body Forces.....	319
<i>N. Yurchenko, J. Delfs</i>	

SESSION F: GENERAL TOPICS

Chairman: H. Zhou

Reynolds Stress Development in the Viscous Layer of a Transitional Boundary Layer.....	327
<i>S. Becker, K.G. Condie, CM. Stoots, D.M. McEligot</i>	

Distortion of Tollmien-Schlichting Waves by Leading-Edge Vortices.....	333
<i>J.H. Watmuff</i>	

Convective and Absolute Instability in the Mixed Convection Boundary Layer Over a Vertical Flat Plate.....	339
<i>P. Moresco, J.J. Healey</i>	

Stability of Poiseuille Flow in a Corrugated Channel.....	345
<i>A. Cabal, J. Szumbariski, J.M. Floryan</i>	

The Transition Zone on a Heated Axisymmetric Body.....	351
<i>R. Govindarajan, R. Narasimha</i>	

SESSION F: GENERAL TOPICS CONTINUED

Chairman: J. van Ingen

The Occurrence of Natural Transition Phenomena in Periodic Transition on Axial Compressor Blades.....	359
<i>G.J. Walker, J.D. Hughes</i>	

Comparisons Between Triggered Turbulent Spots and Unsteady Transition Phenomena on Compressor and Turbine Blading.....	365
<i>J.P. Gostelow, H.P. Hodson, G.J. Walker</i>	

Growth and Breakdown of Streaky Structures in Boundary Layer Transition Induced by Free Stream Turbulence.....	371
<i>M. Matsubara, A.A. Bachinov, J.H.M. Fransson, P.H. Alfredsson</i>	

Onset of Turbulence in Circular Pipe Flows.....	377
<i>A. Tumin</i>	

A Hybrid Spectral/Finite-Difference Scheme for the Simulation of Pipe-Row Transition.....	383
<i>J. Reuter, D. Rempfer</i>	

SESSION G: SUPERSONIC

Chairman: H. Fasel

Transition of Supersonic Boundary Layers (Experiment and Theory Review).....	391
<i>S.A. Gaponov</i>	

Investigation of Transition to Turbulence in a 3D Supersonic Boundary Layer.....	397
<i>C. Mielke, L. Kleiser</i>	

The Blunt Body Paradox—A Case for Transient Growth.....	403
<i>E. Reshotko, A. Tumin</i>	

Hypersonic Boundary-Layer Receptivity and Stability.....	409
<i>M.R. Malik</i>	

Spatial Direct Numerical Simulation of Transition Phenomena in Supersonic Flat-Plate Boundary Layers.....	415
<i>A. Fezer, M. Kloker</i>	

Experimental Investigations of the Hypersonic Boundary Layer Stability.....	421
<i>A.A. Maslov, S.G. Mironov</i>	

Development of a Mach-6 Quiet-Flow Ludwig Tube for Transition Research.....	427
<i>S.P. Schneider</i>	

A Numerical Study for Small Amplitude T-S waves in a Supersonic Boundary Layer.....	433
<i>X.J. Yuan, H. Zhou</i>	

Nonlinear Instability of Hypersonic Flow Over a Cone.....	437
<i>S.O. Seddougui, B. Orme</i>	

POSTER SESSION II

DNS of Boundary-Layer Receptivity to Freestream Sound for Hypersonic Flows Over Blunt Elliptical Cones.....	445
<i>X. Zhong</i>	

Experimental Study of Supersonic Boundary Layer Receptivity in Controlled Conditions.....	451
<i>N.V. Semionov, A.D. Kosinov</i>	

Development of Artificial Disturbances in the Boundary Layer on a Plate and in the Wake Behind It at Supersonic Free-Flow Speed.....	457
<i>V.I. Lysenko, A.D. Kosinov, Y.G. Yermolaev</i>	

On Anomalous Wave Processes in Supersonic Boundary Layer.....	463
<i>A.D. Kosinov, Y.G. Yermolaev, N.V. Semionov</i>	

On the Inviscid Spatial Instability of Supersonic Boundary-Layer Flow Along Bodies of Revolution.....	469
<i>A. Karabis, S.J. Shaw, V. Theofilis</i>	

Experimental Investigations of Disturbance Development in the Hypersonic Boundary Layer on a Conical Model.....	475
<i>DA. Bountin, A.N. Shiplyuk, A.A. Sidorenko</i>	

On the Receptivity Process of Supersonic Laminar Boundary Layer.....	481
<i>S. Sakaue, M. Asai, M. Nishioka</i>	

Low-Order Stability Theory for Non-Parallel Compressible Boundary Layer Flow.....	487
<i>D. Mitra, R. Seshadri, K.S. Rao, R. Govindarajan</i>	
On Correspondence of Laminar-Turbulent Transition Processes in Natural and Controlled Supersonic Experiments on Fiat Plate	493
<i>A.D. Kosinov, Y.G. Yermolaev, N.V. Semionov</i>	
Later Stages of Transition of an Airfoil Boundary Layer Flow Excited by a Harmonic Point Source.....	499
<i>C. Stemmer, M. Kloker</i>	
Experiments on the Transition to Turbulence of the Flow Between a Stationary and a Rotating Disk.....	505
<i>L. Schouveiler, P. Le Gal, M.-P. Chauve</i>	
Maximum Growth of Görtier Vortices.....	511
<i>C. Cossu, J.-M. Chomaz, M. Costa</i>	
Non Normality of the Görtier Operator and Spatial Amplification	517
<i>P. Ardonneau, D. Aymerde la Chevalerie</i>	
Linear Stability of the Supersonic Turbulent Boundary Layer to Görtier Vortices on a Concave Wall.....	523
<i>L.G. Girgis, J.T.C. Liu</i>	
Direct Numerical Simulation of Görtier Instability in Hypersonic Boundary Layers.....	529
<i>C.W. Whang, X. Zhong</i>	
Effect of the Pressure Gradients on the Secondary Instability of Görtier Flow.....	535
<i>F. Bahri, Y. Kohama, J. Uno, Aota</i>	
Laminar-Turbulent Transition of a Separation Flow on a Forward Facing Step.....	541
<i>H. Stüer, A. Gyr, W. Kinzelbach</i>	
Flow Instability in Laminar Separation Bubbles.....	547
<i>A.V. Dovgal</i>	
Experimental Study of the Stability of the Bödewadt Layer.....	553
<i>R.J. Lingwood, P.H. Alfredsson</i>	
Late Stage of Transition in a Circular Pipe Flow.....	559
<i>G. Han, A. Tumin, I. Wygnanski</i>	

DNS-Investigations of the Development and Control of Crossflow Vortices in a 3-D Boundary-Layer Flow.....	565
<i>P. Wassermann, M. Kloker</i>	

3-D Stability and Receptivity of 2-D Self-Similar Boundary Layer with Adverse Pressure Gradient.....	571
<i>Y.S. Kachanov, D.B. Koptsev, B. V. Smorodskiy</i>	

Relation of Glaze Ice Formations on Swept Wings to Crossflow Instability.....	577
<i>E. Reshotko, M. Vargas, KL Reed</i>	

Secondary Stability Analysis of Nonlinear Crossflow Vortices.....	583
<i>T. Wintergerste, L. Kleiser</i>	

SESSION H: CROSSFLOW

Chairman: E. Kerschen

Influence of Surface Roughness and Suction on the Receptivity of a Swept Wing Boundary Layer.....	589
<i>D. Arnal, A. Seraudie, J.P. Archambaud</i>	

Stability and Transition in 3-D Boundary Layers.....	595
<i>T. Herbert</i>	

Absolute/Convective Instability Analysis of Secondary Cross- Flow Vortices in a Three-Dimensional Boundary Layer.....	601
<i>W. Koch</i>	

Stabilization of Boundary-Layer Flows Subject to Crossflow Instability with the Aid of Suction.....	607
<i>C. Abegg, H. Bippes, E. Janke</i>	

Numerical Study of Excitation of Two Different Instabilities in Three-Dimensional Boundary Layer on a Yawed Cylinder.....	613
<i>Y. Yokokawa, Y. Fukunishi, N. höh</i>	

Three-Dimensional Boundary-Layer Transition Phenomena Investigated by Spatial Direct Numerical Simulation.....	619
<i>G. Bonfigli, M. Kloker</i>	

On the Connection Between Cross-Flow Vortices and Attachment-Line Instabilities.....	625
<i>F.P. Bertolotti</i>	

A Theoretical Investigation of the Development of the Stationary Crossflow Vortices in the Boundary Layer on a Swept Wing.....	631
<i>J.S. Luo, H. Zhou</i>	

Experimental Study of Traveling Waves in 3-D Boundary Layer on a Swept Wing.....	+))
<i>V. Levchenko, V. Scherbakov</i>	

Characteristic Features of Traveling Disturbances Originating from a Point Source on a Rotating-Disk Flow.....	637
<i>S. Takagi, N. Itoh, N. Tokugawa, A. Nishizawa</i>	

Multimode Instability of the Three-Dimensional Boundary Layer Along an Infinite Attachment Line.....	643
<i>N. Itoh</i>	

SESSION I: WALL JETS AND SEPARATION

Chairman: E. Reshotko

Numerical Investigation of Heat Transfer Mechanisms in Wall Jet Transition.....	651
<i>J. Seidel, H. Fasel</i>	

Secondary Disturbance Amplification and Transition in Laminar Separation Bubbles.....	657
<i>U. Maucher, U. Rist, S. Wagner</i>	

Global Linear Instabilities in Laminar Separated Boundary Layer Flow.....	663
<i>V. Theofilis</i>	

Transition in Separated Flows Via Global Instability.....	669
<i>B.-J. Wang, DJ. Bogucki, LG. Redekopp</i>	

Effect of Harmonic Excitation on Instability of Laminar Separation Bubble on an Airfoil.....	675
<i>A.V. Dovgal, A.V. Boiko</i>	

Linear and Nonlinear Nonlocal Instability Analyses for Two- Dimensional Laminar Separation Bubbles.....	681
<i>S. Hein</i>	