

**IUTAM Symposium « Unsteady Separated Flows and their Control»
Corfu, Greece, 18-22 June '07**

Detailed programme

Sunday 17 June 2007:

18:00 – 20:00 *Early registration*

Monday 18 June 2007:

09:00 - 11:00 *Registration*

11:00 - 11:30 Welcome address

11:30 – 12:45 **Session I.1**
Experimental techniques for the unsteady flow separation

11:30 - 12:15 *C.H.K. Williamson*, Cornell Univ., USA; **Opening lecture**

Effects of unsteady separated flow phenomena in vortex-induced vibrations

12:15 - 12:30 **D. Sumner, H.B. Hemingson, D.M. Deutscher & J.E. Barth**
(Univ. of Saskatchewan, Canada)
PIV measurements of the flow around oscillating cylinders at low KC numbers

12:30 - 12:45 **A. Fouras, D. Lo Jacono, G. J. Sheard & K. Hourigan**
(Monash Univ., Australia)
Measurement of instantaneous velocity and surface topography of a cylinder at low Reynolds number

12:45 - 14:00 *Lunch*

14:00 - 16:00

Session I.2

Experimental techniques for the unsteady flow separation

14:00 - 14:45

T. Leweke, M.C. Thompson, G.J. Sheard, L. Schouveiler & K. Hourigan , IRPHE, France - FLAIR, Australia; **Invited keynote lecture**

Unsteady flow around impulsively stopped bluff bodies

14:45 - 15:00

R. Perrin, M. Braza, E. Cid, S. Cazin, P. Chassaing, C. Mockett, T. Reimann & F. Thiele

(IMFT, France; TU-Berlin, Germany)

Coherent and turbulent process analysis in the flow past a circular cylinder at high Reynolds number

15:00 - 15:15

K. Gumowski, J. Miedzik, S. Goujon-Durand, G. Bouchet, P. Jenffer & J.E. Wesfreid

(ESPCI - PMMH, IMFS, France)

Wake behind a sphere: experimental and numerical investigations

15:15 - 15:30

H. Park & H. Choi

(Seoul National Univ., Korea)

Investigation of aerodynamic capabilities of flying fish in gliding flight

15:30 - 16:45

M. Gohlke, J.F. Beaudoin, M. Amielh & F. Anselmet

(PSA, IRPHE, France)

Effect of unsteady separation on an automotive bluff-body in cross-wind

16:45 - 16:00

M.R. Soltani & M. Seddighi

(Sharif Univ. of Technology, Iran)

Dynamic stall and flow reattachment studies of a wind turbine blade section in the pitching motion

16:00 - 16:45

Coffee break

16:45 - 18:15

Session II.1

Statistical and hybrid turbulence modeling of unsteady separated flows

16:45 - 17:30

T. B. Gatski, Laboratoire d'Etudes Aérodynamiques, Poitiers, France - Center of Coastal Physical Oceanography and Ocean, Earth and Atmospheric Sciences, Old Dominion Univ. Norfolk; **Invited keynote lecture**

Prediction methodologies for non-stationary turbulent flows

- 17:30 - 17:45 **O. Frederich, U. Bunge, C. Mockett & F. Thiele**
(TU-Berlin, IVM Automotive Wolfsburg GmbH, Germany)
Flow prediction around an oscillating NACA0012 at $Re=1000\ 000$
- 17:45 - 18:00 **J.C. Uribe, N. Jarrin, R. Prosser & D. Laurence**
(Univ. of Manchester, UK - EDF, France)
Two-velocities hybrid RANS-LES of a trailing edge flow
- 18:00 - 18:15 **G. Barakos, S. Lawson, R. Steijl & Punit Nayyar**
(Univ. of Liverpool, UK)
Assessment of flow control devices for transonic cavity flows using
DES and LES
- 18:30 - 19:30 Round table discussion
- 20:00 *Cocktail*

Tuesday, 19 June 2007:

08:30 - 10:30 **Session III.1**
Theoretical aspects & analytical approaches of flow separation

08:30 - 09:15 **A. Kluwick, S. Braun & E.A. Cox**, Technical Univ. of Vienna, Austria - Univ. College Dublin, Ireland; **Invited keynote lecture**

Near critical phenomena in laminar boundary layers

09:15 - 09:30 **L. Baranyi**
(Univ. of Miskolc, Hungary)
State curves and flipping for an orbiting cylinder at low Reynolds numbers

09:30 - 09:45 **R. Dasgupta & R. Govindarajan**
(JNCASR, India)
Study of a lid-driven cavity in an axisymmetric geometry

09:45 - 10:00 **U. Ehrenstein & F. Gallaire**
(IRPHE, Univ. de Nice-Sophia Antipolis, France)
Global low-frequency oscillations in a separating boundary-layer flow

10:00 - 10:15 **J.J. Healey**
(Keele Univ., UK)
Axisymmetric absolute instability of swirling jets

10:15 - 10:30 **V. Theofilis**
(Univ. Politécnica de Madrid, Spain)
Global instability and control of laminar separation bubbles

10:30 - 11:00 *Coffee break*

11:00 – 12:45 **Session III.2**
Theoretical aspects & analytical approaches of flow separation

11:00 - 11:45 **F.T. Smith & N.C. Ovenden**, Univ. College London, UK; **Invited keynote lecture**

New applications with unsteady flow separation analysis

11:45 - 12:00 **R.P. Logue, J.S.B. Gajjar & A.I. Ruban**
(Univ. of Manchester, UK)
Instability of supersonic compression ramp flow

- 12:00 - 12:15 **B. Scheichl & A. Kluwick**
(Vienna University of Technology, Austria)
Asymptotic theory of turbulent bluff-body separation: A novel shear layer scaling deduced from an investigation of the unsteady motion
- 12:15 - 12:30 **G.J. Sheard**
(FLAIR, Australia)
Cylinders with elliptical cross-section: Wake stability with variation in angle of incidence
- 12:30 - 12:45 **P. Luchini, F. Giannetti & J. Pralits**
(Univ. di Salerno, Italy)
Structural stability of the finite-amplitude vortex shedding behind a circular cylinder

Posters of session III

F. Alizard & J.C. Robinet
(ENSAM, France)
Influence of 3D perturbations on separated flows

L. Baranyi
(Univ. of Miskolc, Hungary)
Orbiting cylinder at low Reynolds numbers

B.V. Bharati Laxmi & J.S.B. Gajjar
(Univ. of Manchester, UK)
Global instability computations of separated flow

K. Debbagh & S. Saintlos Brillac
(IMFT, France)
A two-dimensional disturbed flows over a flat plate: theoretical and numerical approach

12:45 - 14:00 *Lunch*

14:00 - 15:45 **Session IV.1**
Instability and transition

14:00 - 14:45 **J.E. Wesfreid, ESPCI, France; Invited keynote lecture**
Forced wakes

- 14:45 - 15:00 **B. Carmo, S. Sherwin, P. Bearman & R. Willden**
(Imperial College London, UK)
Wake transition in the flow around two circular cylinders in staggered arrangements
- 15:00 - 15:15 **A. de Vecchi, S.J. Sherwin & J.M.R. Graham**
(Imperial College London, UK)
Wake dynamics of external flow past a curved circular cylinder with the free-stream aligned with the plane of curvature
- 15:15 - 15:30 **R. Elakoury, G. Martinat, M. Braza, R. Perrin, Y. Hoarau, G. Harran & D. Ruiz**
(IMFT, IMFS, ENSEEIHT, France)
Successive steps of 2D and 3D transition in the flow past a rotating circular cylinder at moderate Reynolds numbers
- 15:30 - 15:45 **V.D. Narasimhamurthy, H.I. Andersson & B. Pettersen**
(NTNU, Norway)
Direct numerical simulation of vortex shedding behind a linearly tapered circular cylinder
- 15:45 - 16:15 *Coffee break*
- 16:15 - 18:30** **Session IV.2**
Instability and transition
- 16:15 - 17:00** ***M.C. Thompson, K. Hourigan & J. Leontini***, FLAIR, Monash Univ., Clayton, Australia; **Invited keynote lecture**
Wake transition of oscillating bluff bodies
- 17:00 - 17:15 **P. Fernandes, P. Ern, F. Risso & J. Magnaudet**
(IMFT, France)
Dynamics of oblate freely-rising bodies
- 17:15 - 17:30 **D. Lucor & M.S. Triantafyllou**
(Massachusetts Institute of Technology, USA)
Parametric study of the two degree-of-freedom vortex-induced vibrations of a cylinder in a two-dimensional flow
- 17:30 - 17:45 **L. Schouveiler, M.C. Thompson, T. Leweke and K. Hourigan**
(IRPHE, France - FLAIR, Monash Univ., Australia)
Vortex dynamics associated with the impact of a cylinder with a wall

- 17:45 - 18:00 **K. Atvars, M.C. Thompson & K. Hourigan**
(FLAIR, Monash Univ., Australia)
Modification of the flow structures in a swirling jet
- 18:00 - 18:15 **H. Djeridi, C. Sarraf & J.Y. Billard**
(Ecole Navale, France)
Thickness effect of NACA symmetric hydrofoils on hydrodynamic behavior and boundary layer states
- 18:15 - 18:30 **A. Mihaiescu, H. Hangan, A. Straatman & J.E. Wesfreid**
(Univ. of Western Ontario, London - ON, N6G 2B9, Canada, ESPCI, France)
Vortex formation in black-step flow

Posters of session IV

S. Behara & S. Mittal
(Indian Institute of Technology, Kanpur, India)
Transition of boundary layer on a circular cylinder in uniform flow

B. Carmo, S. Sherwin, P. Bearman & R. Willden
(Imperial College London, UK)
Numerical simulation of the flow-induced vibration in the flow around two circular cylinders in tandem arrangements

R.S. Gioria & J.R. Meneghini
(Univ. of Sao Paulo, Brazil)
Three-dimensionalities of the flow around an oscillating circular cylinder

S. Srigrarom
(Nanyang Technological Univ., Singapore)
Quasi-steady self-excited angular oscillation of equilateral triangular cylinder in 2-D separated flow

Wednesday , 20 June 2007:

08:30 - 10:00 **Session V.1**
Compressibility effects related to unsteady separation

08:30 - 09:15 **J.P. Dussauge, IUSTI, France; Invited keynote lecture**

Why do shock waves move in separated flows?

09:15 - 09:30 **J. Ziefle & L. Kleiser**
(Institute of Fluid Dynamics, ETH Zurich, Switzerland)
Compressibility effects on turbulent separated flow in a streamwise-periodic hill channel - Part1

09:30 - 09:45 **J.D. Crouch, A. Garbaruk, D. Magidov & L. Jacquin**
(St-Petersburg Univ., Russia - ONERA, France)
Global structure of buffeting flow on transonic airfoils

09:45 - 10:00 **R. Bourguet, M. Braza & G. Harran**
(IMFT, France)
Low-order modeling for unsteady separated compressible flows by POD-Galerkin Approach

10:00 - 10:30 *Coffee break*

10:30 - 12:15 **Session V.2**
Compressibility effects related to unsteady separation

10:30 - 11:15 **P. Doerffer, IMP PAN, Gdansk, Poland; Invited keynote lecture**

European research on unsteady effects of shock wave induced separation - UFAST Projet

11:15 - 11:30 **J.C. Robinet**
(ENSAM, France)
On the three-dimensionality of shock-wave / laminar boundary layer interaction

11:30 - 11:45 **R.A. Humble, F. Scarano & B.W. Van Oudheusden**
(Delft Univ. of Technology, The Netherlands)
Unsteady flow organization of a shock wave/turbulent boundary layer interaction

11:45 - 12:00 **J.F. Debieve & P. Dupont**
(IUSTI, France)
Dependance between shock and separation in a shock wave/boundary layer interaction

12:00 - 12:15 **P. Meliga, P. Reijasse & J.M. Chomaz**
(ONERA - LadHyX, Ecole Polytechnique, France)
Effect of a serrated skirt on the buffeting phenomenon in transonic afterbody flows

Posters of session V:

A. Hadjadj, S. Dubos & G. Ribert
(INSA de Rouen, France)
Large Eddy Simulation of a supersonic turbulent boundary layer at $M=2.25$

P. Reijasse & L. Boccaletto
(ONERA - CNES, France)
Film cooling mass flow rate influence on a separation shock in an axisymmetric nozzle

12:15 - 14:00 *Lunch*

14:00 - 15:30 **Session II.2**
Statistical and hybrid turbulence modeling of unsteady separated flows

14:00 - 14:45 **W. Haase, EADS, München, Germany; Invited keynote lecture**

DESider - Detached Eddy Simulation for Industrial Aerodynamics

14:45 - 15:00 **R.B. Langtry & P.R. Spalart**
(The Boeing Company, USA)
Detached Eddy Simulation of a nose landing-gear cavity

15:00 - 15:15 **E. Guilmineau & F. Chometon**
(Ecole Centrale de Nantes - CNAM, France)
Experimental and numerical study of unsteady wakes behind an oscillating car model

15:15 - 15:30 **R. Bourguet, M. Braza, R. Perrin & G. Harran**
(IMFT, France)
Physical analysis of an anisotropic eddy viscosity concept for strongly detached unsteady flows

- 15:30 - 16:00 *Coffee break*
- 16:00 - 16:45** **Session II.3**
Statistical and hybrid turbulence modeling of unsteady separated flows
- 16:00 - 16:15 **G. Martinat, M. Braza, G. Harran, A. Sevrain, Y. Hoarau & D. Favier**
(IMFT - IMFS - LABM - France)
Dynamic stall of a pitching and horizontally oscillating airfoil
- 16:15 - 16:30 **R. Elakoury, M. Braza, Y. Hoarau, J. Vos, G. Harran & A. Sevrain**
(IMFT, IMFS, France - CFS engineering, Switzerland)
Unsteady flow around a NACA0021 airfoil beyond stall at 60° angle of attack
- 16:30 - 16:45 **C. Mockett, R. Perrin, T. Reimann, M. Braza & F. Thiele**
(TU-Berlin, Germany)
Analysis of Detached-Eddy Simulation for the flow around a circular cylinder with reference to PIV data
- 16:45 - 19:30 *Free*
- 19:30 *Venue at Achilleion Palace/Museum - visit and gala dinner*

Thursday , 21 June 2007:

08:30 - 10:00 **Session II.4**
Statistical and hybrid turbulence modeling of unsteady separated flows

08:30 - 09:15 *P. Sagaut*, Univ. Paris VI, France; **Invited keynote lecture**

On the use of LES for flow control: the compressible cavity flow case

09:15 - 09:30 **J. Paik, C. Escauriaza & F. Sotiropoulos**

(Univ. of Minnesota, USA)

On the coherent dynamics of turbulent junction flows

09:30 - 09:45 **S. Schmid, T. Lutz & E. Krämer**

(IAG Univ. of Stuttgart, Germany)

Simulation of the unsteady cavity flow of the stratospheric observatory for infrared astronomy

09:45 - 10:00 **M.V. Salvetti, B. Koobus, S. Camarri & A. Dervieux**

(Univ. di Pisa, Italy)

Simulation of bluff-body flows through a hybrid RANS/VMS-LES model

Poster of session II

I.A. Fedorchenko, N.N. Fedorova & U. Gaisbauer

(ITAM, Russia - IAG Univ., Germany)

Numerical simulation of non-steady supersonic double ramp flow by URANS Approach

10:00 - 10:30 *Coffee break*

10:30 - 13:00 **Session VI**
DNS and LES of unsteady separated flows

10:30 - 11:15 *B.J. Geurts*, Univ. of Twente, The Netherlands; **Invited keynote lecture**

Regularization modeling for large-eddy simulation of turbulent separated boundary layer flow

- 11:15 - 11:30 **O. Marxen & D.S. Henningson**
(KTH, Sweden)
Direct numerical simulation of the bursting of a laminar separation bubble and evaluation of flow-control strategies
- 11:30 - 11:45 **G. Palau-Salvador, T. Stoesser, J. Fröhlich & W. Rodi**
(Karlsruhe Univ., Germany)
LES of the flow around two cylinders in tandem
- 11:45 - 12:00 **E. de Martel, E. Garnier & P. Sagaut**
(ONERA - LMM, Univ. Pierre et Marie Curie, France)
Large Eddy Simulation of impinging shock wave / turbulent boundary layer interaction at M=2.3
- 12:00 - 12:15 **L. Georges, J.F. Thomas, G. Winckelmans & P. Geuzaine**
(CENAERO, Belgium)
Design and validation of a Large Eddy Simulation methodology for compressible shock-free flows on unstructured meshes
- 12:15 - 12:30 **M. Pino Martin & M. Wu**
(Princeton Univ. USA)
On coherent structures and low frequency motions of shock wave-turbulent boundary layer interactions via DNS
- 12:30 - 12:45 **F. Richez, I. Mary, V. Gleize & C. Basdevant**
(ONERA, France)
Simulation and modelling of a laminar separation bubble on airfoils
- 12:45 - 13:00 **G.J. Sheard, R.G. Evans, K.M. Denton & K. Hourigan**
(Monash Univ., Australia)
Undesirable haemodynamics in aneurysms

Posters of session VI:

J. Hoessler, J.F. Beaudoin & F. Perot
(PSA Peugeot Citroën, France)
Unsteady separated flow around the Ahmed body

J. Yao, O. Mouzoun, Y.F. Yao & P. Mason
(Kingston Univ., UK)
Unsteady RANS Calculation of Flow over Ahmed Car Model

13:00 - 14:15

Lunch

14:15 - 15:45

Session I.3

Experimental techniques for the unsteady flow separation

14:15 - 15:00

M. Provansal & P. Monkewitz, IRPHE, France - LMF EPFL, Switzerland; **Invited keynote lecture**

Vortex shedding dynamics in the laminar wakes of various bluff bodies (cylinders, spheres and cones)

15:00 - 15:15

M.S. Adaramola, D. Sumner & D.J. Bergstrom

(Univ. of Saskatchewan, Canada)

Effect of velocity ratio on the streamwise vortex structures in the wake of a stack

15:15 - 15:30

K.K.Y. Tsang, R.C.K. Leung & R.M.C. So

(The Hong Kong Polytechnic Univ., Hong Kong)

Unsteady force measurements of an airfoil undergoing dynamic stall at low Reynolds number

15:30 - 15:45

T. Weier, C. Ciepka & G. Gerbeth

(Forschungszentrum Rossendorf, Germany)

Coherent structure eduction from PIV data of an electromagnetically forced separated flow

Posters of session I

M. Fuchiwaki & K. Tanaka

(Kyushu Institute of Technology, Japan)

Detailed wake structure behind unsteady airfoils and characteristics of dynamic thrust

S.C. Luo, T.T.L. Duong & Y.T. Chew

(National Univ. of Singapore, Singapore)

Flow separation of a rotating cylinder

S.D. Sharma & A.A. Kumar

(Indian Institute of Technology Bombay, India)

Unsteady flow behind a blunt based POD model

M.R. Soltani & M.R. Amiralaei

(Sharif Univ. of Technology, Iran)

Effect of oscillation amplitude on the aerodynamic behaviour of a pitching wing

M.R. Soltani & A.H. Birjandi

(Sharif Univ. of Technology, Iran)

Unsteady study of a contaminated wind turbine blade section

- 15:45 - 16:15 *Coffee break*
- 16:15 - 18:30** **Session VII.1**
Theoretical/Industrial aspects of unsteady separated flow control
- 16:15 - 17:00** ***M. Triantafyllou***, Massachusetts Institute of Technology, USA;
Invited keynote lecture
- Unsteady separated flows and their control**
- 17:00 - 17:15 **D. Lo Jacono, J.N. Sorensen, M.C. Thompson & K. Hourigan**
(FLAIR, Monash Univ., Australia - Technical Univ. of Denmark)
Control of vortex breakdown in a closed cylinder with a small rotating rod
- 17:15 - 17:30 **B. Stewart, K. Hourigan, M. Thompson & T. Leweke**
(Monash Univ. Australia - IRPHE, France)
The wake dynamics of a cylinder moving along a plane wall with rotation and translation
- 17:30 - 17:45 **K.W. Cassel, C. Sardesai, S. Braun & A.I. Ruban**
(MMAE, Illinois I. of Tech., USA - I. of FMTH, Vienna Univ. of Tech., Austria - Univ. of Manchester, UK)
Sub-optimal control of unsteady separation in a channel
- 17:45 - 18:00 **J. Favier, A. Kourta & L. Cordier**
(IMFT - LEMTA, France)
Accurate POD reduced-order models of separated flows
- 18:00 - 18:15 **B. Günther, R. Becker, A. Carnarius, F. Thiele & R. King**
(TU-Berlin, Germany)
Simulation study of a robust closed-loop control of a 2D high-lift configuration
- 18:15 - 18:30 **S. Jeon & H. Choi**
(Seoul National Univ., Korea)
Linear proportional control of flow over a sphere

Friday , 22 June 2007:

08:30 - 10:15

Session VII.2

Theoretical/Industrial aspects of unsteady separated flow control

08:30 - 09:15

T. Bewley, Univ. of California San Diego, USA; **Invited keynote lecture**

Multiscale retrograde estimation and forecasting of chaotic nonlinear systems

09:15 - 09:30

N. Benard, J. Jolibois, M. Forte, G. Touchard & E. Moreau

(LEA, Univ. de Poitiers, France)

Spreading and vectoring of a subsonic axisymmetric air jet by plasma actuator : a preliminary study

09:30 - 09:45

P. Compte, F. Daude & I. Mary

(ENSMA - ONERA, France)

Simulation of the reduction of the unsteadiness in a passively-controlled transonic cavity flow

09:45 - 10:00

O. Cadot, B. Thiria & J.F. Beaudoin

(ENSTA, France)

Passive drag control of a turbulent wake by local disturbances

10:00 - 10:15

T. Stephens, C. Atkinson & J. Soria

(Monash Univ., Australia)

The effect of zero-net-mass-flux jet geometry on active separation control of a NACA0015 airfoil

10:15 - 10:45

Coffee break

10:45 - 12:45

Session VII.3

Theoretical/Industrial aspects of unsteady separated flow control

10:45 - 11:30

C.M. Ho, S. Ho, P.K. Wong & H. Nassef, Univ. of California, Los Angeles, Office of the Secretary of Defense, Washington, Univ. of Arizona, Fluidiqm Inc, San Francisco, USA; **Invited keynote lecture**

Control systems with large parameter spaces

11:30 - 11:45

T.N. Jukes & K.S. Choi

(Univ. of Nottingham, UK)

Active control of a cylinder wake using surface plasma

- 11:45 - 12:00 **D. You & P. Moin**
(Stanford Univ. USA)
Active control of flow separation over an airfoil using synthetic jets
- 12:00 - 12:15 **H. Nagib, J. Keidaisch, D. Greenblatt, I. Wygnanski & A. Hassan**
(Illinois I. of Tech., USA - TU-Berlin, Germany - Univ. of Arizona, USA - The Boeing Company, USA)
Flow control for rotorcraft applications at flight Mach numbers
- 12:15 - 12:30 **G. Mutschke, T. Weier, T. Albrecht, G. Gerbeth & R. Grundmann**
(Forschungszentrum Rossendorf - Dresden Univ. of Technology, Germany)
Electromagnetic control of separation at hydrofoils
- 12:30 - 12:45 **V. Kitsios, A. Ooi, J. Soria & D.You**
(Univ. Of Melbourne - Monash Univ., Australia)
A numerical study of ZNMF jet lift enhancement of a NACA 0015 airfoil
- 12:45 - 14:00 *Lunch*
- 14:00 - 15:30** **Session VII.4**
Theoretical/Industrial aspects of unsteady separated flow control
- 14:00 - 14:45** **A. Dauplain, J. Favier & A. Bottaro, Univ. di Genova, Italy; **Invited keynote lecture****

Hydrodynamics of beating cilia
- 14:45 - 15:00 **E. Konstantinidis, C. Liang, G. Papadakis & S. Balabani**
(Univ. of Western Macedonia, Greece - Iowa State Univ., USA - King's College London, UK)
Control of the separated flow behind a circular cylinder by low forcing – Experiments and computations
- 15:00 - 15:15 **B. Protas**
(McMaster Univ., Hamilton, Canada)
Vortex models for feedback stabilization of bluff body wake flows
- 15:15 - 15:30 **P.S. Vavilis & J.A. Ekaterinaris**
(Univ. of Patras, Greece)
Computational investigation of flow control over wings
- 16:00 - 16:30 Closing address

Posters of session VII:

R.E.A. Arndt & M. Wosnik

(Univ. of Minnesota, Minneapolis)

Towards the control of cavitating flows

R.M. Kerimbekov & O.R. Tutty

(Univ. of Southampton, UK)

Active control of flows with trapped vortices

M.A. Langthjem & M. Nakano

(Yamagata Univ., Japan)

A three-dimensional numerical study into non-axisymmetric perturbations of the hole-tone feedback cycle

A. Orellano & M. Schober

(Bombardier, Germany)

Flow control in high-speed train applications

M.R. Soltani, K. Ghobanian, M. Gholamrezaei & M.R. Amiralaei

(Sharif Univ. of Technology, Iran)

Neural network prediction of aerodynamic coefficients of a pitching wing

M. Vanierschot & E. Van den Bulck

(Katholieke Univ. Leuven, Belgium)

Flow control of annular jet expansion using cross-flow injection
