



European Drag Reduction and Flow Control Meeting

EDRFCM 2015

23-26 March 2015
Cambridge, UK

Meeting Schedule

Monday 23rd March

Session 1: 8:30 – 10:30

8:30 Welcome

Plasma flow control A

8:50 Invited lecture: FLOW CONTROL BY PLASMA ACTUATORS
E. Moreau, N. Benard, CNRS, University of Poitiers

9:30 NUMERICAL STUDY OF REDUCING TURBULENT SKIN-FRICTION DRAG USING DBD PLASMA ACTUATORS

Qiang Yang, Yongmann M. Chung, University of Warwick

9:50 NUMERICAL MODELLING OF CROSS-FLOW DOMINATED TRANSITION CONTROL BY MULTIPLE-ELECTRODES DBD ACTUATORS

D.A. Russianov, M. V. Ustinov, TsAGI

10:10 CAUSE-EFFECT RELATIONS BETWEEN DISCHARGE CAPACITANCE AND VOLUME FORCES OF DBD PLASMA ACTUATORS

M. Kuhnhenh, B. Simon, I. Maden, S. Grundmann, TU Darmstadt
J. Kriegseis, KIT

10:30 Coffee Break

Session 2: 11:00 – 13:00

Plasma flow control B

11:00 CONTROL MECHANISM OF DBD PLASMA ACTUATOR FOR DEEP-STALL FLOW AROUND NACA0015 AT $Re = 6.3 \times 10^4$

H. Kato, University of Tokyo

M. Sato, H. Aono, A. Yakeno, K. Fujii, JAXA

11:20 FLAT PLATE VORTEX SHEDDING NOISE SUPPRESSION WITH SURFACE DIELECTRIC BARRIER DISCHARGE PLASMA ACTUATORS

A. Laith, T. P. Chong, Brunel University London

J. H. Kim, University of Nottingham

11:40 CONTROL OF THE LEADING-EDGE FLOW SEPARATION USING DBD PLASMA ACTUATORS

Longfei Song and Kwing-So Choi, University of Nottingham

12:00 DISTRIBUTED FORCING OF THE WAKE OF A BLUNT TRAILING EDGE PROFILED BODY USING PLASMA ACTUATORS TO REDUCE PRESSURE DRAG

A. Naghib-Lahouti, P. Lavoie, University of Toronto Institute for Aerospace Studies

Icing control

12:20 ANN MODEL FOR ICE SHAPE PREDICTION OF AN AIRFOIL

Zhen Tian, Shanghai Jiao Tong University

Kwing-So Choi, University of Nottingham

12:40 THE ACCRETION OF MIXED ICE ON AN AIRCRAFT WING DUE TO THE PARTIAL FREEZING OF IMPINGING SUPERCOOLED DROPLETS

Janjua, Z.A., Turnbull, B., Hibberd, S., Choi, K-S, University of Nottingham

13:00 Lunch

Session 3: 14:20 – 16:00

Riblets

14:20 RIBLET DRAG REDUCTION AND THE EFFECT OF BULK FLUID ROTATION IN A FULLY TURBULENT TAYLOR-COUPETTE FLOW

A.J. Greidanus, R. Delfos, S. Tokgöz, J. Westerweel, Delft University of Technology

14:40 EXPERIMENTAL AND NUMERICAL INVESTIGATION OF RIBLETS IN A FULLY DEVELOPED TURBULENT CHANNEL FLOW

V. Fink, A. Güttler, B. Frohnäpfel, KIT

15:00 EFFECT OF RIBLETS ON A COMPLEX CONFIGURATION IN TRANSONIC CONDITIONS

B. Mele, R. Tognaccini, University Federico II Napoli

P. Catalano, CIRA

15:20 THERMAL RIBLETS: CONCEPTUAL APPROACH TO FLOW CONTROL

N. Yurchenko, Institute of Hydromechanics NASU

15:40 LINEARLY OPTIMAL SPANWISE BOUNDARY MODULATIONS FOR WAKE INSTABILITY CONTROL

O. Tammisola, University of Nottingham

16:00 Coffee Break

Session 4 (afternoon): 16:30 – 17:30

Roughness

16:30 TURBULENT DRAG REDUCTION BY POROUS COATINGS

N. Abderrahaman, R. Garcia-Mayoral, University of Cambridge

16:50 REGULAR AND IRREGULAR SURFACES IN TURBULENT CHANNEL FLOWS

D. Sassun, P. Orlandi, Università di Roma La Sapienza

17:10 TURBULENT DRAG REDUCTION DUE TO ELECTROSTATIC FLOCKING SURFACE WITH GROOVES

S. Tamano, H. Kurisaki, H. Ikarashi, and Y. Morinishi, Nagoya Institute of Technology

18:45 Dinner

Tuesday 24th March

Session 1: 8:30 – 10:30

Synthetic jets

8:30 Invited lecture: ACTIVE FLOW CONTROL USING SYNTHETIC JETS

J. J. Wang, L. H. Feng, Beijing University of Aeronautics and Astronautics

9:10 CONTROL OF NEAR-WALL STRUCTURES IN A TURBULENT BOUNDARY LAYER USING SYNTHETIC JETS

E. Spinosa, S. Zhang, S. Zhong, University of Manchester

9:30 SPATIO-TEMPORAL COHERENT FLOW STRUCTURE EVOLUTION OF ZNMF JET CONTROLLED NACA 0015 AIRFOIL FLOW

J. Soria, C. Atkinson, N. Buchman, V. Kitsios, Monash University Melbourne

9:50 NUMERICAL OPTIMIZATION OF A ZERO-NET-MASS-FLUX ACTUATION FOR A HIGH LIFT AIRFOIL

V. Ciobaca, DLR

Jet flows A

10:10 FLOW CONTROL USING ANNULAR JETS

T. Jukes, J. Lirvat, F. Nicolas, Dyson

G. R. Hunt, University of Cambridge

10:30 Coffee Break

Session 2: 11:00 – 12:40

Jet flows B

11:00 SYSTEMS ARCHITECTURE AND IMPLEMENTATION COSTS OF SWEEPING JET ACTUATORS FOR SEPARATION CONTROL

M. Jabbal, Brunel University

S. Raghu, Advanced Fluidics LLC, USA

11:20 CONTROL OF CAVITY-INDUCED DRAG USING STEADY JETS

N. Al Haddabi, K. Kontis, H. Zare-Behtash, S. Winblad-Rasmussen, University of Glasgow

11:40 CONTROL OF WING LOADS BY MEANS OF BLOWING AND MINI-TABS

D.J. Heathcote, N. Al-Battal, I. Gursul, D.J. Cleaver, University of Bath

Noise control

12:00 LARGE EDDY SIMULATION OF A FLOW CONTROL DEVICE FOR NOISE REDUCTION DUE TO A CROR/PYLON INTERACTION

N. Gourdain, Y. Bury, L. Dupont, J. Bodart and L. Joly, ISAE, Toulouse

12:20 CONTROL OF CAVITY TONE BY SPANWISE ALIGNED JETS IN UPSTREAM BOUNDARY LAYER

H. Yokoyama, R. Adachi, T. Minato, H. Odawara, H. Morishima and A. Iida, Toyohashi University of Technology

12:40 Lunch

14:00 Excursion

18:45 Dinner

Wednesday 25th March

Session 1: 8:30 – 10:30

Polymers

8:30 Invited lecture: FLOW DEVELOPMENT AND DEGRADATION IN THE POLYMERIC AND MAXIMUM DRAG REDUCTION REGIMES

P. S. Virk, A. L. Shields, Massachusetts Institute of Technology

9:10 A NOVEL DRAG-REDUCING COATING MATERIAL: FDR-SPC (FRICTIONAL DRAG REDUCTION SELF-POLISHING COPOLYMER)

Inwon Lee, Hyun Park, Ho Hwan Chun, Pusan National University

Laser Energy Deposition

9:30 DRAG FORCE CONTROL FOR HEMISPHERE-CYLINDER UNDER THE ACTION OF LASER ENERGY DEPOSITION

O. A. Azarova, Dorodnicyn Computing Center of RAS Moscow

D. D. Knight, Rutgers University, New Jersey

Hydrophobic surfaces A

9:50 A MODEL FOR TURBULENT DRAG REDUCTION OVER LIQUID INFUSED MICRO-TEXTURED SURFACES

M. K. Fu, M. Hultmark, Princeton University

10:10 INFLUENCE OF SURFACE PATTERN ON SLIP LENGTHS FOR SUPERHYDROPHOBIC SURFACES

C. T. Fairhall, R. Garcia-Mayoral, University of Cambridge

10:30 Coffee Break

Session 2: 11:00 – 13:00

Hydrophobic surfaces B

11:00 DYNAMIC RESPONSE OF GAS-LIQUID INTERFACES IN SUPERHYDROPHOBIC SURFACES

R. Garcia-Mayoral, University of Cambridge

J. Seo, A. Mani, Stanford University

11:20 REDUCTION OF TURBULENT FRICTION BY HYDROPHOBIC SURFACES WITH SHEAR-DEPENDENT SLIP LENGTHS

S. Khosh Aghdam, P. Ricco, M. Seddighi, University of Sheffield

11:40 THE RELEVANCE OF LONGITUDINAL AND TRANSVERSE PROTRUSION HEIGHTS FOR DRAG REDUCTION BY A SUPERHYDROPHOBIC SURFACE

P. Luchini, Università di Salerno

12:00 TRANSITION DELAY IN PLANE CHANNEL FLOW USING SUPERHYDROPHOBIC COATING

J. O. Pralits, A. Bottaro, Università di Genova

Wall oscillations A

12:20 DRAG-REDUCING WALL OSCILLATIONS VIA DIELECTRIC ELASTOMER ACTUATORS IN LOW REYNOLDS NUMBER INTERNAL TURBULENT FLOWS

D. Gatti, A. Güttler, B. Frohnappel, C. Tropea, KIT

12:40 SKIN-FRICTION DRAG REDUCTION BY SPANWISE FORCING: THE REYNOLDS-NUMBER EFFECT

M. Quadrio, Politecnico di Milano

D. Gatti, KIT

13:00 Lunch

Session 3: 14:20 – 16:00

Wall oscillations B

14:20 COMBINATION OF WALL TRANSPIRATION AND SPINNING RINGS FOR TURBULENT DRAG REDUCTION

P. Ricco, S. Khosh Aghdam, M. Seddighi, University of Sheffield

14:40 OSCILLATING DISCS FOR TURBULENT DRAG REDUCTION

D.J. Wise, P. Ricco, University of Sheffield

15:00 TURBULENT DRAG REDUCTION VIA SPINNING DISCS AND RINGS.

C. Alvarenga, D.J. Wise, P. Ricco, University of Sheffield

15:20 IN-PLANE FORCING OF A TURBULENT BOUNDARY LAYER, THROUGH THE ACTUATION OF A COMPLIANT STRUCTURE.

J. Bird, M. Santer, J. F. Morrison, Imperial College London

Turbulent flow control A

15:40 ON THE RELATION BETWEEN NEAR-WALL SKIN FRICTION AND LARGE-SCALE COHERENT MOTIONS IN TURBULENT BOUNDARY LAYERS

A. Basso, N. Rkiouak, K.-S. Choi, University of Nottingham

16:00 Coffee Break

Session 4 (afternoon): 16:30 – 17:30

Turbulent flow control B

16:30 SKIN FRICTION DRAG REDUCTION USING UNSTEADY BLOWING THROUGH ONE ARRAY OF STREAMWISE SLITS

Yinzhe Li, Yu Zhou, Harbin Institute of Technology, Shenzhen, China

16:50 DOWNSTREAM DEVELOPMENT OF LOCALLY CONTROLLED TURBULENT BOUNDARY LAYER

A. Stroh, B. Frohnafel, KIT

P. Schlatter, KTH

Y. Hasegawa, University of Tokyo

17:10 ON WHY CONTROL OF TURBULENT FLOWS IS NON-TRIVIAL AND WHY IT IS POSSIBLE

A. Tsinober, Tel Aviv University

19:30 Banquet dinner

Thursday 26th March

Session 1: 8:30 – 10:30

Compliant structures

8:30 Invited lecture: INTERACTION OF FLEXIBLE FILAMENTS WITH THE WAKE OF CYLINDER AT LOW REYNOLDS NUMBERS

M. Omidyeganeh and A. Pinelli, City University London

9:10 STUDY OF FLOW AROUND NACA0020 AEROFOIL WITH HAIRY FLAPS DURING RAMP-UP MOTION

M. E. Rosti, M. Omidyeganeh, A. Pinelli, City University London

9:30 DRAG REDUCTION OF A SQUARE CYLINDER USING COMPLIANT FLAPS

N. Mazellier, A. Feuvrier, A. Kourta, Univ. Orléans

**9:50 CONTROL FOR FLAT PLATE SKIN-FRICTION DRAG WITH COMPLIANT COATINGS
(PREDICTIONS AND EXPERIMENT)**

V. M. Kulik, A.V. Boiko, Russian Academy of Sciences, Novosibirsk
Ho Hwan Chun, Inwon Lee, Pusan National University

10:10 WAVE PROPERTIES OF A COMPLIANT COATING IN A FLUID FLOW

Vasily Vedenev, Lomonosov Moscow State University

10:30 Coffee Break

Session 2: 11:00 – 13:00

Laminar flow Control

**11:00 RECENT INVESTIGATIONS INTO LAMINAR FLOW CONTROL FOR NACELLE
APPLICATION**

James Tweedie, Liam Magee, Bombardier Aerospace Belfast, UK

**11:20 SIMULATION OF PRESSURE LOSSES FOR THE DESIGN OF TAILORED SUCTION
DISTRIBUTIONS FOR LAMINAR FLOW CONTROL**

P. Scholz, L. Klug, TU Braunschweig
L.M.M. Boermans, TU Delft

**11:40 ADAPTIVE SECONDARY PATH FOR ADAPTIVE CONTROLLERS IN LAMINAR BOUNDARY
LAYER CONTROL**

B. Simon, T. Nemitz, S. Grundmann, J. Rohlfing, F. Fischer, TU Darmstadt
D. Mayer, Fraunhofer Darmstadt

12:00 TOLLIEN-SCHLICHTING WAVE CANCELLATION BY FEEDBACK CONTROL

H. Vemuri, J.F. Morrison, E.C. Kerrigan, Imperial College London

**12:20 RELAMINARISATION OF TURBULENT CHANNEL FLOW WITH PASSIVITY-BASED LINEAR
FEEDBACK CONTROL**

K. Septham, J. F. Morrison, Imperial College London

12:40 RECENT PROGRESS USING THE AFRODITE FLOW CONTROL STRATEGY

R. S. Downs, J. H. M. Fransson, KTH

13:00 Lunch

Session 3: 14:20 – 15:20

Flow separation control

14:20 DRAG REDUCTION ON A SIMPLIFIED 3D BLUFF BODY

C. Sardu, S. Sedda, G. Iuso, Politecnico di Torino

**14:40 EXPERIMENTAL OPEN-LOOP AND CLOSED-LOOP CONTROL OF A MASSIVE
SEPARATED BOUNDARY LAYER AT HIGH REYNOLDS NUMBER**

C. Raibaud, A. Polyakov, J.P. Richard, F. Kerhervé, M. Stanislas, Ecole Centrale de Lille, CNRS

**15:00 FLOW OVER NACA0012 AIRFOIL INFLUENCED BY UPSTREAM CIRCULAR CYLINDER
WAKE**

WU Jun, FENG Lihao, PAN Chong, GAO Qi, WANG Jinjun, Beijing University of Aeronautics &
Astronautics

LI Tian, AVIC Shenyang Aircraft Design and Research Institute, Shenyang

15:20 Coffee Break

15:40 Round-the-table discussions

16:40 Farewell