

International Journal of **Flow Control**

Volume 1 · Number 1 · March 2009

Multi-Science Publishing
ISSN 1756-8250

International Journal of Flow Control

Volume 1 · Number 1 · March 2009

Editorial

Dr. Surya Raghu.....i

Successes and Challenges for Flow Control Simulations

Christopher L. Rumsey1

Active Yaw Control of a Ducted Fan-Based MAV using Synthetic Jets

Kiyoshi Otani, Joseph Moore, William Gressick and Michael Amitay.....29

Using Linear Stability Analysis as a Tool to Evaluate Jet and Cavity Flow Control Situations

Praveen Panickar and Ganesh Raman43

Flow Control of Jet Flow by Passive Nozzle Configuration Changes

T. Shakouchi, M. Kito, T. Sakamoto, K. Tsujimoto and T. Ando73

Combustion Powered Actuator with Integrated High Frequency Oscillator

Thomas M. Crittenden and Surya Raghu.....87

Editorial

It is my pleasure to introduce the first issue of the International Journal of Flow Control. Flow control has become a highly multi-disciplinary research activity encompassing theoretical, computational and experimental fluid dynamics, acoustics, control theory, physics, chemistry, biology and mathematics. It is the objective of this journal to provide a forum for publication of articles covering the widest range of perspectives on flow control in one place and is hoped that this will increase the cross-pollination of ideas on flow control into the various sub-disciplines.

In the field of aerospace engineering, the aerodynamic design of future civilian and military aerospace vehicles will be greatly influenced by flow control technologies available for jet engine inlet and exhaust systems, thrust vectoring, weapons-bay cavity flow/acoustics, impinging jet noise reduction, and propulsion devices such as jet engines and rockets. These flow control systems will be used in a variety of flow situations to modify the shear layers and control mixing, energize the boundary layers to control flow separation, produce jet deflections, and to control resonant cavity oscillations. Control of boundary layer transition in both low-speed and high-speed ablating and non-ablating conditions is also an important area of flow control. Associated with high-speed flows is also the control of aero-optics effects. Flow control in turbomachinery is needed to increase efficiency of thrust and power generation while reducing environmental footprints and noise. Efficient combustor designs and stable compressor flows using flow control are needed for such purposes. In the area of alternative energy technologies, flow control over wind turbine blades will lead to higher efficiencies of such systems. Progress in biomimetic flight systems could be based on new ideas for flow control in unsteady situations. Drag reduction in trucks and passenger vehicles could decrease fuel consumption, thereby reducing their pollution footprints into the environment.

In the field of biomedical engineering, modification of the flow properties of the blood for drag reduction in the arteries by addition of polymers/chemistry control in the blood could reduce the number of heart attacks or strokes due to clotting. Advanced drug delivery systems could be designed on the basis of our ability to control certain fluid properties and trajectories by direct physical manipulation or remote control of either the delivery systems or the fluids of interest.

In the field of chemical engineering, flow control could mean control of mixing to obtain highly efficient and controlled chemical reactions and development of chemical reactors based on new mixing control technologies.

We welcome contributions in all the above areas of flow control and any other area that the potential authors think is related to flow control.

I would like to express my gratitude to the members of the Editorial Advisory Board Prof. Mohammad Samimy of Ohio State University and Prof. Mohammad Gad el Hak of Virginia Commonwealth University for their valuable advice and members of the Board of Editors - Prof. Michael Amitay, Dr. Anuradha Annaswamy, Prof. Jean-Paul Bonnet, Prof. Louis N. Cattafesta, Dr. Tom Crittenden, Prof. James W. Gregory, Prof. Dr.-Ing. Rudibert King, Prof. Ganesh Raman, Prof. Toshihiko Shakouchi, Dr. Michael J. Stanek, Mr. Xunnian Wang, Prof. Xin Zhang for their service on the editorial board. My special thanks to Prof. Ganesh Raman and to Prof. Louis Cattafesta for many suggestions during the planning stage of this journal. The illustration on the cover depicts control of supersonic jets. The Schlieren image was contributed by Prof. Ganesh Raman of the Illinois Institute of Technology. I also appreciate the outstanding efforts of the staff at Multi-science publishing for all their efforts in the production of this journal.

Editor-in-chief
Dr. Surya Raghu