

## SUMON KUMAR SINHA Ph.D., P.E.

### PROFESSIONAL EXPERTISE AND INTERESTS

Principal Area: Experimental Fluid Dynamics, Micro-Adaptive Flow Control, Applied Aerodynamics

Current Focus: Aircraft Drag Reduction using Patent pending “Flexible Composite Surface Deturbulator”

Other interests:

Convective Heat Transfer and Thermal Sciences

Compact Heat Exchangers and applications to Renewable Energy Systems

Computational Fluid Dynamics

### EDUCATION

**Ph.D. in Mechanical Engineering**, University of Miami, Coral Gables, Florida, May 1986.

**M.S. in Mechanical Engineering**, University of Miami, Coral Gables, Florida, December 1981.

**B.Tech (Honors) in Mechanical Engineering**, Indian Institute of Technology, Kharagpur, India, May 1978.

Professional Engineer (Mechanical), State of Florida, 1985.

### EXPERIENCE

- 1) **SINHATECH**, ([www.sinhatech.com](http://www.sinhatech.com)) Oxford, Mississippi. (1989-present) **Founder, President and Chief Engineer.**
- 2) **University of Mississippi**, (Aug 1989-Jan 2007) Mechanical Engineering Department:  
Associate Professor (Tenured)
- 3) **University of Nebraska-Lincoln**, Mechanical Engineering Department, Lincoln, Nebraska:  
Visiting Assistant Professor (August 1988-August 1989).
- 4) **Florida International University**, Department of Industrial Engineering, Miami, Florida:  
Visiting Assistant Professor (August 1987-August 1988).
- 5) **Florida International University**, Department of Mechanical Engineering, Miami, Florida: 1986  
to 1987 Adjunct Research Faculty  
1984 to 1985, Visiting Assistant Professor  
1983 to 1984, Adjunct Lecturer
- 6) **University of Miami**, Department of Mechanical Engineering, Coral Gables, Florida:  
1979 to 1986 Instructor  
1978 to 1984, Research Assistant  
1978 to 1981, Teaching Assistant
- 7) **Champion Lighting Co Inc.**, Hialeah, Florida: (Feb, 1982 to Dec, 1983): **Chief Engineer**

## **HONORS, AWARDS AND NOMINATED MEMBERSHIPS**

Main Focus of Article by **Richard H. Johnson**, 2007, "A Flight Test Evaluation of the Sinha Wing Performance Enhancing Deturbulators," SOARING and Motorgliding Magazine, The Journal of the Soaring Society of America Inc., Vol 71., No.5, May 2007, pp. 35-41.

Johnson's summary: "*The new Sinha-Deturbulator could be the first really significant drag reducing aerodynamic invention since the development of the now common laminar-flow airfoils that were developed some 65 years ago.*"

Main Focus of Article by **Roake, J.H., ed.**, 2005, "Sailplane Performance Increases You Can Only Dream About: Meet Sumon Sinha," New Zealand Gliding Kiwi, June-July 2005, Vol.28, No. 9., pp. 12-18.

Senior Member, American Institute of Aeronautics and Astronautics, 1997

Expedited Award for Novel Research, National Science Foundation, 1988.

Sigma Xi, Scientific Research Society, Nominated Member 1994.

Phi Kappa Phi, U.S. National Scholastic Honor Society, 1981.

Teaching and Research Assistantships, Univ. of Miami, 1978.

Jagadis Bose National Science Talent Search Scholar, India, 1973.

National Science Talent Search (Govt. of India) Scholar in Mathematics, 1973.

Ranked 5th out of over 100,000 candidates in the W. Bengal State Higher Secondary Exam., India, 1973.

## **PROFESSIONAL SOCIETY MEMBERSHIPS**

1. American Institute of Aeronautics and Astronautics (Senior Member).
2. American Society of Mechanical Engineers (Member).
3. Society of Automotive Engineers (Member)
4. Sigma Xi, Scientific Research Society, Nominated Member 1994.

## **PATENTS**

1. **Sinha, S.K.**, "The ACOUSTOSURF - a Multi-Element Acoustic Active Surface for Flow Separation Control", U.S. provisional patent application no. 60/030,489, November, 1996.
2. **Sinha, S.K.**; "System for Efficient Control of Flow Separation using a Driven Flexible Wall," U.S. Patent No. 5,961,080, October 5,1999.
3. **Sinha, S.K.**, "A Flexible Composite Surface for Enhancing Heat Transfer in Heat Exchanger Passages without Increasing Flow Pressure Drop" U.S. Provisional Patent Application 60/354,702, filed Feb 4, 2002.
4. **Sinha, S.K.**, "System and Method for Using a Flexible Composite Surface for Pressure-Drop Free Heat Transfer Enhancement and Flow Drag Reduction," U.S. Patent Applications 10/355,346, filed Jan 31, 2003.

5. **Sinha, S.K.**, “System and Method for Using a Flexible Composite Surface for Pressure-Drop Free Heat Transfer Enhancement and Flow Drag Reduction,” PCT filed in UK, Germany, Switzerland and India Jan 31,2003. (USPTO Pub. No. US-2003-0145980-A1, Aug 2003).
6. **Sinha, S.K.**, “Enhancing the Efficiency of A Flexible Composite Surface for Pressure-Drop Free Heat Transfer Enhancement and Flow Drag Reduction,” U.S. Provisional Patent Application 60/503,958, filed Sept 2003.
7. **Sinha, S.K.**, “System and Method for Enhancing Lift and Reducing Flow Drag with a Flexible Composite Surface,” U.S. Provisional Patent Application No., 60/666,639, Filed March 29, 2005.
8. **Sinha, S.**, and **Sinha, S.K.**, , “A Method For Reducing Drag of Slender Objects,” U.S. Provisional Patent Application, 60/666,963, Filing Date 03/30/2005.
9. **Sinha, S.**, and **Sinha, S.K.**, “Method for using a Flexible Surface Deturbulator to Reduce the Aerodynamic Drag of Bluff Bodies”; U.S. Provisional Patent Application No. 60/784,047, Filing Date 03/20/2006; Foreign Filing License Granted 04/07/2006.
10. **Sinha, S.**, and **Sinha, S.K.**, “METHOD OF REDUCING DRAG AND INCREASING LIFT DUE TO FLOW OF A FLUID OVER SOLID OBJECT”, International Patent Application No.: PCT/US2006/011430, international Publication Number WO 2006/105174 A2 with an International Publication Date of 5 October 2006.
11. **Sinha, S.K.**, “System and Method for Using a Flexible Composite Surface for Pressure-Drop Free Heat Transfer Enhancement and Flow Drag Reduction,” U.S. Patent Applications 11/489,790, filed July 19, 2006, USPTO publication US-2006-0254751-A1 (Nov 16, 2006).

## **PUBLICATIONS**

### **A) ARTICLES IN THE FLOW CONTROL/EXPERIMENTAL AERODYNAMICS AREA**

Articles under preparation:

1. **Sinha S.K.**, “Flexible Surface Deturbulators to Enhance Lift to Drag Ratio of Airframes,” Annual Technical Conference of the American Society of Composites, Seattle, WA, Sept 17-19, 2007 (Abstract Accepted)

Articles Published/presented:

- 1) **Sinha, S.K. and Sinha, S.L.**, "Improving Automotive Fuel Efficiency with Deturbulator Tape" (Paper #:2007-01-3458), SAE 14<sup>th</sup> Asia Pacific Automotive Engineering Conference, August 5-8, 2007, Hollywood, CA, USA.
- 2) **Sinha, S.K.**, “Optimizing Wing Lift to Drag Ratio Enhancement with Flexible-Wall Turbulence Control”, AIAA Paper No. 2007-4425, 25<sup>th</sup>. AIAA Applied Aerodynamics Conference, June 25-28, 2007, Miami, FL, U.S.A.
- 3) **Sinha, S.K., and Ravande, S.V.**, “Sailplane Performance Improvement Using a Flexible Composite Surface Deturbulator,” AIAA Paper 2006-0447, 44<sup>th</sup> AIAA Aerospace Sciences Meeting, Reno, NV, Jan 9-12, 2006.
- 4) **Sinha, S.K., and Ravande, S.V.**, “Drag Reduction of Natural Laminar Flow Airfoils with a Flexible Surface Deturbulator”, AIAA Paper 2006-3030, 3<sup>rd</sup>. AIAA Flow Control Conference, San Francisco, CA, June 5-8, 2006.

- 5) **Mangla, N.L.**, and **Sinha, S.K.**, 2004, "Controlling Dynamic Stall with an Active Flexible Wall" AIAA Paper AIAA-2004-2325; 2<sup>nd</sup> AIAA Flow Control Conf, Portland, June 28-July 1, 2004.
- 6) **Sinha, S.K.**, "Aircraft Drag Reduction with Flexible Composite Surface Boundary Layer Control," AIAA paper AIAA-2004-2121; 2<sup>nd</sup> AIAA Flow Control Conf, Portland, June 28- July 1, 2004.
- 7) **Sinha, S.K.**, "Flow Separation Control with Microflexural Wall Vibrations," *Journal of Aircraft*, Special Issue on Flow Control (Vol.38, No.3., May-June-2001) pp. 496-503.
- 8) **Sinha, S.K.**, "Exploring Separating Boundary Layers With a Flexible Wall Transducer Array," Proc. ASME FEDSM-01, 2001 **ASME Fluids Eng Summer Meet**, New Orleans, LA, May 29-June 1, 2001.
- 9) **Pal, D** and **Sinha, S.**, "Controlling Unsteady Separation on a Cylinder With a Driven Flexible Wall" *AIAA Journal*, Vol.36, No.6., 1998, pp. 1023-1028.
- 10) **Sinha, S.**, and **Zou, J.**, "On Controlling Flows with Micro-Vibratory Wall Motion," (AIAA Paper 2000-4413) Invited Paper, **18th AIAA Applied Aerodynamics Conference**, Denver, CO, August 2000.
- 11) **Sinha, S.K.**, **Wang, H.**, and **Zou, J.**, "Interaction of an Active Flexible Wall with Separating Boundary Layers," AIAA Paper 99-3594, **30<sup>th</sup> AIAA Fluid Dynamics Conference**, Norfolk, VA, June-July 1999. (Also being submitted to the *AIAA Journal*.)
- 12) **Sinha, S.**, "Active Flexible Walls for Efficient Aerodynamic Flow Separation Control," (AIAA Paper 99-3123), Invited Paper, **17th AIAA Applied Aerodynamics Conference**, Norfolk, VA, June-July 1999.
- 13) **Pal, D.**, **Sinha, S.K.**, **Wang, H.**, **Zou, J.**, and **Chen, J.**, "Characterization of a Flexible Wall Sensor for Boundary Layer Pressure Fluctuation Measurements,"(AIAA Paper No. 99-0389), **AIAA 37th Aerospace Sciences Meeting**, Reno, NV, Jan 1999.
- 14) **Sinha, S.K.**, and **Wang, H.**, "Improving the Efficacy of an Active Flexible Wall for Controlling Flow Separation," AIAA Paper No. 99-0923, **AIAA 37th Aerospace Sciences Meeting**, Reno, NV, Jan 1999.
- 15) **Sinha, S.K.**, **Pal, D.**, "On Controlling Flow Separation with a Driven Flexible Surface," **The Seventh Asian Congress of Fluid Mechanics**, Chennai, India, Dec 8-12, 1997, Proceedings, Vol.I., pp. 323-326., **Allied Publishers Limited**, New Delhi, 1997.
- 16) **Sinha, S.K.**, **Wang, H.**, and **Pal, D.**, "Interaction of Separating Flows with a Driven Flexible Surface," **AIAA 36th Aerospace Sciences Meeting**, Reno, NV, January 1998, (AIAA Paper, 98-0603).
- 17) **Sinha, S.K.**, **Pandey, M.**, **Wang, H.**, and **Pal, D.**, "Using an Array of Transducers under a Compliant Wall to Detect and Control Dynamic Stall on a Pitching Airfoil," **AIAA 36th Aerospace Sciences Meeting**, Reno, NV, January 1998, (AIAA Paper, 98-0678).
- 18) **Pal, D.**, **Sinha, S.**, **Banerjee, D.**, **Baker, C.**, and **Pandey, M.**, "A Compliant Wall Sensor Array for Detecting Pressure Fluctuation Signatures in Separating

Boundary Layers," **AIAA 35th Aerospace Sciences Meeting**, Reno, NV, January 1997, (AIAA Paper, 97-0391).

- 19) **Pal, D., and Sinha, S.**  
"Controlling an Unsteady Separating Boundary Layer on a Cylinder With an Active Compliant Wall," **AIAA 35th Aerospace Sciences Meeting**, Reno, NV, January 1997, (AIAA Paper 97-0212).
- 20) **Sinha, S.K., Pal, D., and Banerjee, D.**  
"Control of Flow Separation using the MEMS Approach: Proof of Concept Experiments," **Proceedings of the Symposium on Micro-electro-mechanical Systems (MEMS), DSC-Vol. 59**, American Soc. of Mechanical Engineers International Mechanical Engineering Congress and Exposition, Atlanta, Georgia, November 1996, pp. 253-263.
- 21) **Sinha, S., and Pal, D.**  
"Control of Mixing in Combustors by Small-Amplitude Acoustic Perturbations," **AIAA 33rd. Aerospace Sciences Meeting**, Reno, NV, January 1995, (AIAA Paper No. 95-0284).
- 22) **Sinha, S.K., and Pal, D.**  
"Controlling Unsteady Separation with Acoustic Active Surfaces," **AIAA 32nd Aerospace Sciences Meeting**, Reno, NV, January 1994, (AIAA Paper No: 940183).
- 23) **Sinha, S.**  
"Active Control Using Acoustically Active Surfaces", Proceedings of **The Workshop on Inherent Nonsteadiness in Compressors and Turbines (WINCAT)**, Purdue University, West Lafayette, Indiana, Oct 4-6, 1993 (pp. 405-414).
- 24) **Sinha, S.K., and Pal, D.**  
"On the Differences between the Effect of Acoustic Perturbation and Unsteady Bleed in Controlling Flow Separation over a Cylinder," **SAE AEROTECH 93**, Costa Mesa, CA, September 1993, (SAE Paper No: 932573).
- 25) **Sinha, S.K., and Pal, D.**  
"Optimizing the Use of Acoustic Perturbation to Control Unsteady Boundary Layer Separation", **ASME Fluids Engineering Conference**, Washington, D.C., June 1993. (FED-Vol.157; pp.33-46).
- 26) **Sinha, S., and Shields, F.D.**  
"Acoustically Active Surfaces for Boundary Layer Control", **Proceedings of the American Soc. of Mechanical Engineers Winter Annual Meeting**, Pressure Vessel and Piping Division/Fluids Engineering Division, Atlanta, GA, December 1991, PVP Vol. 224/FED Vol. 126, pp. 17-19.

## **B) PUBLICATIONS IN OTHER AREAS**

- 27) **Sinha, S.**  
"A Conductivity Salinometer for Continuous Monitoring of Small Density Changes over an Extended Region" **Review of Scientific Instruments**, 58(9), 1987. (pp. 1746-1748).
- 28) **Sinha, S. and Sengupta, S.**  
"A Two-Dimensional Model for Buoyancy and Shear Driven Flows in Domains with High Aspect Ratios" **Applied Mathematical Modelling**, Vol. 11, October 1987, (pp. 364-370).

- 29) **Sinha, S.**  
"Improving the Accuracy and Resolution of Particle Image or Laser Speckle Velocimetry"  
**Experiments in Fluids**, (6),1988. (pp. 67-68).
- 30) **Sinha, S.**, and **Kuhlman, P.**,  
"Investigating the use of Stereoscopic Particle Streak Velocimetry for Estimating the Three-Dimensional Vorticity Field", **Experiments in Fluids**, Vol. 12, No.6, 1992, (pp. 377-384).
- 31) **Sinha, S.**, **Mangla, N.**, and **Tang, Z.**  
"Application of Interpolators in Stereoscopic Particle Tracking Velocimetry" (invited paper;  
**Journal of Applied Science and Computations**, Vol1., No.2, October 1994.
- 32) **Sinha, S. and Sengupta, S.**  
"An Investigation of Destratification in Enclosed Basins due to Surface Shear", **ASME Wint. Ann. Meeting**, Anaheim, Dec 1986. (HTD-Vol. 60, pp. 59-68).
- 33) **Sinha, S. and Sengupta, S.**  
"A Device for Measuring Transient Density Profiles in Stratified Flows", **ASME/AIAA Fluids Eng. Conf.**, Atlanta, May 1986. (FED-Vol. 34, pp. 39-41).
- 34) **Sinha, S. and Sengupta, S.**  
"A Two-Dimensional Model for Buoyancy and Shear Driven Flows in Domains with High Aspect Ratios", **ASME Wint. Ann. Meeting**, Boston, 1983, (FED Vol. 8, pp. 11-18).
- 35) **Sinha, S., Nwadike, E., Sengupta, S. and Lee, S.**  
"Numerical Simulation of the Thermal Discharge of Oconee Power Plant into Lake Keowee", **3rd. Conference on Waste Heat Management and Utilization**, Miami Beach, 1981.
- 36) **Nwadike, E., Sinha, S., Sengupta, S. and Lee, S.**  
"Physical Limnology of Lake Keowee, I- Thermal Characteristics", **3rd. Conf. on Waste Heat Management and Utilization**, 1981.
- 37) **Sinha, S.**  
"On obtaining Quantitative Information from Qualitative Flow Visualization Diagrams" **ASME Winter Annual Meeting**, Boston, December 1987., (FED-Vol.54, pp. 17-20).
- 38) **Sinha, S.**  
"Investigating the Instability of an Air-Cushion Vehicle Operating over Water" Presented in the **Forum on Industrial Applications of Fluid Mechanics** at the **ASME Winter Annual Meeting**, Boston, December 1987.
- 39) **Sinha, S.**  
"Mechanisms for Wind-Induced Erosion of the Non-Conducting Zone in Solar Ponds" **ASME Winter Annual Meeting**, Chicago, November 1988. (ASME Paper No. 88-WA/SOL-4).
- 40) **Kuhlman, P.**, and **Sinha, S.**,  
"Using Interactive Computer Graphics for Analyzing Three-Dimensional Flow Images,"  
Proceedings of **University Programs in Computer Aided Engineering, Design & Manufacturing (UPCAEDM 90)**, Univ. of Michigan, Ann Arbor, Aug. 1990, pp. 19-25.
- 41) **Sinha, S.**, and **Kuhlman, P.**,

- "Investigating the use of Stereoscopic Particle Streak Velocimetry for Measuring the Three-Dimensional Vorticity Field", Proceedings of the **Twelfth Symposium on Turbulence**, Sept 24-26, 1990, Univ. of Missouri-Rolla, pp. B16-1 to B16-8.
- 42) **Sinha, S.**, and **Kuhlman, P.**,  
"Determination of the 3-D Vorticity Field in Unsteady Flows using Stereoscopic Particle Tracking", **ASME Winter Annual Meeting**, Dallas, November 1990, (FED-Vol.102, PVP-Vol.204 pp. 61-63).
- 43) **Sinha, S.**, and **Valliappan, M.**,  
"A Solar Powered Air-Compression Dehumidifier", **ASME Winter Annual Meeting**, Dallas, November 1990, (SED-Vol.10, pp. 27-32).
- 44) **Mangla, N.L.**, and **Sinha, S.K.**,  
"Application of Computer-Aided Optimization in Particle Tracking Velocimetry", **IMACS International Symposium**, Bangalore, India, December 1992.
- 45) **Mangla, N.L.**, and **Sinha, S.K.**,  
"On Improving the Accuracy of Stereoscopic Particle Imaging Technique towards Estimating the Three-Dimensional Vorticity Field", **ASME Fluids Engineering Conference**, Los Angeles, June 1992. (FED-Vol.133; pp.157).
- 46) **Rajendran, V.P.**, **Kolaini, A.R.**, and **Sinha, S.K.**,  
"Characterization of an Axisymmetric Turbulent Jet Using 3-D Particle Tracking Velocimetry", **ASME Fluids Engineering Conference**, Washington, D.C., June 1993. (FED-Vol.155; pp. 7-11).
- 47) **Sinha, S.**, and **Valliappan, M.**,  
"On Solar Air-Conditioning by Compression Dehumidification" **AIAA 32nd Aerospace Sciences Meeting**, Reno, NV, January 1994, (AIAA Paper No. 940116).
- 48) **Kolaini, A.**, **Sinha, S.**, and **Rajendran, V.**  
"Interaction of Bubbles with Turbulent Flow", Preprints (Sessions W1 through TH5) **Twentieth Symposium on Naval Hydrodynamics**, Santa Barbara, CA, August 21-26, 1994. (pp.199-208). **National Academy Press**, 1996 pp. 742- 751. (The article is followed by a discussion by Oguz, H of Johns Hopkins U., pp. 752)
- 49) **Sinha, S.**,  
"Exploring Electrically Induced Thermal Property Changes in ER Fluids," **Heat and Mass Transfer 95**, (Tata McGraw Hill Ltd., New Delhi, 1996); Proceedings of the Second ASME/ISHMT Heat and Mass Transfer Conference and Thirteenth National Heat and Mass Transfer Conference., Surathkal, India, S. Srinivasa Murthy and Y Jaluria ed., Dec 28-30, 1995 , Paper No. HMT-95-018, pp.161-171.
- 50) **Salomon, J.B.**, **McCarty, T.A.**, and **Sinha, S.K.**,  
"An Approach for Analyzing Biochemical Processes in Wetlands using Artificial Neural Networks" **Conference on Management of Landscapes Disturbed by Channel Incision**, Oxford, MS May 19-22, 1997.