Richard A. Korpus, Ph.D.
Applied Fluid Technologies, Inc.
326 First Street, Suite 34
Annapolis, Maryland U.S.A. 21403
+01-410-703-2112

SUMMARY:

More than twenty years experience developing, validating, and applying viscous flow Computational Fluid Dynamics (CFD) techniques. Most recent experience centers on transitioning Reynolds-Averaged Navier-Stokes (RANS) research codes into real-world design environments, and applying the resulting tools to develop advanced naval and aero system concepts. Areas of focus cover a wide range of vehicle design, design optimization, trajectory analysis, structural load analysis, and fluid-induced vibration problems. Business sectors where successful applications have been completed include: naval, automotive, chemical, acoustical, commercial shipbuilding, offshore exploration, nuclear, and environmental.

Theoretical training as a computational fluid dynamicist includes a broad background in applied and numerical mathematics. Research experience includes the development of finite volume and finite element methods, variational methods, and boundary integral techniques. Specific interests include the application of computational fluid dynamics to system performance analysis, advanced vehicle design, and the experimental verification of numerical algorithms.

PROFESSIONAL EXPERIENCE:

09/00 – Present: Principal Scientist, Applied Fluid Technologies, Incorporated
Founder and Chief Operating Officer of an engineering consulting firm devoted to the application of computational fluid dynamics for solving practical design and operational problems. Developed automated gridding systems to enable Reynolds-Averaged Navier-Stokes simulations to be performed for hundreds of design alternatives. Resulting tools have been successfully applied to analyze and improve the design of high-speed ocean transport vessels, water jet inlets, ship appendages, and aerodynamics lifting systems. They have also been successfully integrated into concurrent engineering performance analysis systems, and to derive more accurate model test extrapolation procedures.

01/89 – 08/00: Senior Scientist, Science Applications International Corporation
Directed the development, validation, and application of computational methods for viscous, incompressible flows in the Ship Technology Division. Primary responsibilities from 1991 to 2000 included principal investigator developing SAIC's Finite-Analytic Reynolds-Averaged Navier-Stokes code. Successful developments included the installation of improved turbulence models; implementation of a Chimera grid capability; development of propulsor/hull coupling techniques; code efficiency improvements; and a variety of validation demonstrations. Developed and validated a general "overset" gridding capability that allows RANS to be used for complex problems. Applied the resulting capability to design, analysis, and fluid structures interaction problems in the naval, offshore, and refining sectors.

09/84 - 12/88: Graduate Student Research Assistant, University of Michigan
Developed a number of computational methods for the analysis of marine propulsors. With thesis chairman Bram van Leer, developed a second order asymptotic method for predicting the nonlinear effects of wake roll-up in rotational flows. Work also included the development of analytical and numerical methods for the optimization of propulsor load distributions, and the development of a "super-convergent" boundary integral technique. Held two temporary positions relating to experimental fluid dynamics: 1) ORI, Inc. -- installed and demonstrated a two beam LDV for the Navy at the David Taylor Research Center; 2) The Michigan Ship Hydrodynamics Laboratory -- designed test hardware and data acquisition software.

01/82 - 08/84: Project Engineer, Exxon International Company
Managed a number of hydrodynamics related R&D projects aimed at increasing vessel operating efficiency. This work included development of a boundary layer model to study the effects of surface roughness, and an investigation of turbulent flow drag reduction by polymer injection.

05/81 - 10/81: Quality Assurance Engineer, Lockheed Missiles and Space Company
Designed, implemented, and monitored production quality control projects for a number of fleet ballistic missile hardware systems.

EDUCATION:

Ph.D., Naval Architecture, University of Michigan, 1989
M.S.E., Aerospace Engineering, University of Michigan, 1988
M.S.E., Naval Architecture, University of Michigan, 1985
B.S.E., Naval Architecture, University of Michigan, 1981
B.S.E., Aerospace Engineering, University of Michigan, 1981

MISCELLANEOUS:

Adjunct Assistant Professor, University of Maryland, Aerospace Engineering
Adjunct Assistant Professor, University of New Orleans, Naval Architecture
Member, American Institute of Aeronautics and Astronautics
EIT Certificate, State of New York, 1982

SELECTED PUBLICATIONS

"Performance Prediction without Empiricism: A RANS-Based VPP and Design Optimization Capability," Richard Korpus, 18th Chesapeake Sailing Yacht Symposium, Annapolis, MD, 2007.

"Active and Passive Control of Spar Vortex-Induced Motions," Richard Korpus and Stergios Liapis, *Journal of Offshore Mechanical and Arctic Engineering, v. 129, n.2 , 2007.*

"Reynolds-Averaged Navier-Stokes in an Integrated Design Environment," Richard Korpus, Madrid Diseno de Yates, Madrid, 2004.

"High Speed Trimaran Drag: Numerical Analysis and Model Tests," Edward Amromin, Igor Mizine, Leonard Crook, William Day, and Richard Korpus, *Journal of Ship Research,* 2003.

"International America's Cup Class Yacht Design Using Viscous Flow CFD," Paul Jones and Richard Korpus, Transactions of the 15th Chesapeake Sailing Yacht Symposium, Annapolis, Maryland, 2001.

"Prediction of Viscous Forces on Oscillating Cylinders by Reynolds-Averaged Navier-Stokes Solver," Richard Korpus, Paul Jones, Owen Oakley, and Leonard Imas, Transactions of the International Society of Offshore and Polar Engineers, Seattle, Washington, May, 2000.

"Hydrodynamic Design of Integrated Propulsor/Stern Concepts by Reynolds-Averaged Navier-Stokes Techniques," Richard Korpus, Bryan Hubbard, Paul Jones, Chel Stromgren and James Bennett, Transaction of the *Seventh International Symposium on Practical Design of Ship and Mobile Units* (PRADS), The Hague, The Netherlands, September 20-25, 1998.

"Support of Advanced Sail Design by Chimera-Based Reynolds-Averaged Navier-Stokes Simulations (U)," Rich Korpus, Bryan Hubbard, Paul Jones, Jay Casper, Charles Schemm, J.E. Koski and L.P. Manzi, SAIC Document Control #9801486, Presented at the *1st Symposium on Marine Applications of Computational Dynamics*, McLean, Virginia, May 19-21, 1998.

"Computation of Noise Due to the Flow Over a Circular Cylinder," Sanjay Kumarasamy, Richard A. Korpus and Jewel B. Barlow, *Proceedings of the Second Computational Aeroacoustics (CAA) Workshop on Benchmark Problems*, Tallahassee, Florida, November 4-5, 1996, NASA Conference Publication 3352, pgs. 297-303, June 1997.

"Prediction of Viscous Ship Roll Damping by Unsteady Navier-Stokes Techniques," R.A. Korpus and J.M Falzarano, Proceedings of the *15th International Conference on Offshore Mechanics and Arctic Engineering*, Florence, Italy, June 16-20, 1996, OMAE, Volume 1, Part A, Offshore Technology ASME, pgs. 241-247, 1996.

"Near-Field Flow Predictions for Ship Design," Kenneth M. Weems, Richard A. Korpus, Woei-Min Lin and Martin J. Fritts, Presented at the *Twentieth Symposium on Naval Hydrodynamics*, Santa Barbara, California, August 1994.

"A Multi-Block Finite-Analytic Reynolds-Averaged Navier-Stokes Method for 3D Incompressible Flows," Hamn-Ching Chen and Richard Korpus, Presented at the *ASME Summer Fluids Engineering Conference,* Washington, D.C., June 1993.

"An Asymptotic Model for Propeller Vortex Sheets in Rotational Flow," R. Korpus, Ph.D. Thesis, The University of Michigan, 1989.

"Marine Propulsors for Minimum Shaft Horsepower," R. Korpus and T. Brockett, 21st ATTC, 1986.

"A Parametric Evaluation of the Lifting-Line Model for Conventional and Pre-Swirl Propulsors," T. Brockett and R. Korpus, *Proceedings of the International Symposium on Propellers and Cavitation*, 1985.

SELECTED LIST OF CUSTOMERS

Applied Physics Laboratory	Submarine signature analysis
Band Lavis Associates	Waterjet inlet analysis
Bath Iron Works	Propulsor/hull integration
Bruce Farr Yacht Design	America's Cup Yacht Design
Charles Stark Draper Laboratory	Physics of swimming bodies
Chevron Petroleum Research Company	Vortex-induced vibration
Defense Applied Research Projects Administration	RANS development and validation
Ford Motor Company	Vehicle acoustics
Garona Nuclear Agencie de Seguridad	Fluid-induced failure analysis
Gulf Coast Maritime Technology Center	Roll damping of ships
Kvaerner/Masa Marine	High-speed vessel design
Monsanto Chemical	Fluid-induced structural excitation
Naval Facilities Engineering Support Center	Hydrodynamic stability analysis
Naval Sea Systems Command	Submarine design and analysis
Naval Surface Warfare Center	RANS development and validation
Nelson-Marek Yacht Design	America's Cup Yacht Design
Newport News Shipbuilding	Submarine maneuvering analysis
Newport News Commercial Shipbuilding	Propeller design
Office of Naval Research	Propulsor cavitation analysis
Oracle/BMW Racing	Aerodynamic analysis and design
Pugot Sound Naval Shipyard	Environmental impact studies
Science Applications International Corporation	Transition model development
Studio Ceccarelli	America's Cup Yacht Design
University of Maryland Glenn L. Martin Wind Tunnel	Bluff body aerodynamics
University of New Orleans	Unsteady RANS development