

## **Steve Karman, *Professor***

### **Date of Appointment**

1 February 2003

### **Education**

PhD, Aerospace Engineering, University of Texas at Arlington, 1991  
MS, Aerospace Engineering, Texas A&M University, 1982  
BS, Aerospace Engineering, Texas A&M University, 1980

### **Employment**

*Professor*, Graduate School of Computational Engineering, University of Tennessee at Chattanooga, July 2009 to present

*Research Professor*, SimCenter: National Center for Computational Engineering, University of Tennessee at Chattanooga, 2003 to June 2009

*CFD Technical Lead*, Lockheed Martin Aeronautics Company, Fort Worth, TX, Aerodynamics and CFD Branch, deployed to Advanced Development Program (Skunk Works), 1999 to 2003

*Specialist Senior*, Lockheed Martin Tactical Aircraft Systems, Fort Worth, TX, CFD Group, 1995 to 1999

*Engineering Group Specialist*, Lockheed Martin Tactical Aircraft Systems, Fort Worth, TX, CFD Group, 1991 to 1995

*Engineering Specialist*, General Dynamics-Fort Worth Division, Fort Worth, TX, CFD Group, 1988 to 1991

*Senior Engineer*, General Dynamics-Fort Worth Division, Fort Worth, TX, CFD Group, 1986 to 1988

*Engineer*, General Dynamics-Fort Worth Division, Fort Worth, TX, Aeroanalysis Group/CFD Group, 1983 to 1986

### **Peer Reviewed Publications**

1. "Analysis of the F-16 Flow Field by a Block Grid Euler Approach," AGARD-CP-412 Paper No. 18, Published November, 1986.
2. "Generation of Multiple Block Grids for Arbitrary 3D Geometries," Printed in the AGARDOGRAPH on Mesh Generation, J. Steger and J. Thompson, co-authors, February, 1987.
1. "Development of a 3D Unstructured CFD Method," Ph.D. Dissertation, May 1991, University of Texas at Arlington.
3. "Benchmark Calculations with an Unstructured Grid Flow Solver on a SIMD Computer," Proceedings of the Supercomputing 1989 Conference, November 1989. IEEE Computer Society Order Number 2021.
4. "Unstructured Cartesian/Prismatic Grid Generation for Complex Geometries," NASA Conference Publication 3291, "Surface Modeling, Grid Generation, and Related Issues in Computational Fluid Dynamics," 1995.
5. "Mesh Generation Using Unstructured Computational Meshes and Elliptic Partial Differential Equation Smoothing," AIAA Journal Volume 44, Number 6, pp 1277-1286, June 2006.
6. "Unstructured Viscous Layer Insertion Using Linear-Elastic Smoothing", AIAA Journal, Volume 45, Number 1, pp.168-180, 2007.
7. "F-16XL Geometry and Computational Grids Used in Cranked-Arrow Wing Aerodynamics Project International", AIAA Journal of Aircraft, Volume 46, Number 2, pp. 369-376, March-April 2009
8. "Reynolds-Averaged Navier-Stokes Solutions for the CAWAPI F-16XL Using Different Hybrid Grids", AIAA Journal of Aircraft, Volume 46, Number 2, pp. 409-422, March-April 2009

9. "Geometry Parameterization Method for Multidisciplinary Applications", AIAA Journal, Volume 47, Number 6, pp. 1568-1578, June 2009.

### **Peer Reviewed Presentations**

1. "Multiple-Block Grid Method Applied to Complex 3-D Geometries," Presented at Society for Industrial and Applied Mathematics 1986 National Meeting, July 1986, Boston, Mass. Unpublished.
2. "Development of an Unstructured CFD Method," AIAA-1991-0019, 1991.
3. "Calibration of 2D Unstructured Grid Methods on Propulsive Flowfields," AGARD Fluid Dynamics Panel Symposium on "Aerodynamic Engine-Airframe Integration," Paper No. 27, October, 1991.
4. "SPLITFLOW: A 3D Unstructured Cartesian/Prismatic Grid CFD Code for Complex Geometries," AIAA-1995-0434, 1995.
5. "Rapid Assessment of F-16 Store Trajectories Using Unstructured CFD," AIAA-1995-0354, 1995.
6. "Implementation of Low Speed Preconditioning in the Splitflow Code," AIAA-1997-1867, 1997.
7. "SPLITFLOW: Progress in 3 D CFD with Cartesian Omni-Tree Grids for Complex Geometries," AIAA-2000-1006, 2000.
8. "Hierarchical Unstructured Mesh Generation," AIAA-2004-0613, 2004.
9. "Grid Control of Viscous Unstructured Meshes Using Optimization", AIAA-2006-532, January 2006.
10. "3D Visualization and Manipulation of Geometry and Surface Meshes", AIAA-2006-944, January 2006.
11. "Application of an Unstructured Free Surface Flow Solver for High Speed Transom Ships", 26<sup>th</sup> Symposium on Naval Hydrodynamics, Rome Italy, September 2006.
12. "Unstructured Adaptive Elliptic Smoothing", AIAA-2007-0559, January 2007.
13. "Unstructured Grid Solutions of CAWAPI F-16XL by UT SimCenter", AIAA-2007-0681, January 2007.
14. "Computational Prediction of Forces and Moments for Transport Aircraft", AIAA-2007-1088, January 2007.
15. "Turbulence Modeling for Highly Separated Flows", AIAA-2007-1407, January 2007.
16. "Parallel Hierarchical Unstructured Mesh Generation with General Cutting", AIAA -2008-0918, January 2008.
17. "Hierarchical Unstructured Mesh Generation with General Cutting for Free Surface Simulations", 27<sup>th</sup> Symposium on Naval Hydrodynamics, October 2008.
18. "Unstructured Elliptic Smoothing Revisited", AIAA-2009-1362, January 2009.
19. "CFD Modeling of F-35 Using Hybrid Unstructured Meshes", AIAA-2009-3662, June 2009.

### **Grants/Contracts/Awards**

\$50,000 – Research on Solver Algorithms, Intelligent Light, Inc. 2004-2005  
\$700,674 – A Generalized Framework for Constrained Design Optimization of General Supersonic Configurations using Adjoint Based Sensitivity Derivatives, NASA Langley Research Center. (Principal Investigator) 2007  
\$1,527,000 – Validated Aerodynamic Analysis and Design Tools for Integrated Embedded Aircraft Propulsion Systems, NASA Glenn Research Center (Co-Investigator) 2007  
\$148,000 – Adjoint Methods for Sensitivity Analysis, Error Estimation, and Adaptive Meshing, CoE Appl. Comp. Sci. Engr. (Principal Investigator) 2005-2006  
\$95,000 – Adjoint Method for Magnetohydrodynamic Simulations, CoE Appl. Comp. Sci. Engr. (Principal Investigator) 2005-2006  
\$124,000 – Computational Analysis and Design of Fuel Cell Components, CoE Appl. Comp. Sci. Engr. (Principal Investigator) 2005-2006  
\$10,580 Pointwise – Gridgen Teaching License Program, Yearly  
Pointwise Visiting Research Professor, May 2008  
AIAA MVCE TC Best Paper 2006, AIAA 2006-0531, "Unstructured Viscous Layer Insertion Using Linear-Elastic Smoothing"

### **Academic Specialties**

Computational Fluid Dynamics  
Internal and External Aerodynamics  
Unstructured Mesh Generation and Solution Adaptive Meshing  
Design Optimization

## Commitment to Graduate Education UTC

Beasley, James	MS	Graduated 2004
Burdyshaw, Chad	Ph.D.	Graduated 2006
Mitchell, Brent	MS	Graduated 2007
Betro, Vincent	MS (Chair)	Graduated 2007
Elliott, Louie	Ph.D.	Graduated 2008
Sahasrabudhe, Mandar	Ph.D. (Chair)	Graduated 2008
Hilbert, Bruce	MS (Chair)	Graduated 2009
Whitt, Justin	MS (Chair)	Graduated 2009
Ellis, Dawn	Ph.D. (Chair)	
Betro, Vincent	Ph.D. (Chair)	
Ji, Lei	Ph.D.	
Hilbert, Bruce	Ph.D. (Chair)	
Whitt, Justin	Ph.D. (Chair)	
Chackasserilvarghese, Jacob	MS (Chair)	
Masters, James	Ph.D. (Chair)	
Workman, Nick	Ph.D.	

## UTC Courses

ENCM 591 - Special Topics in Engineering, “Special Topics in Grid Generation”, Fall 2003.  
ENCM 516 - Grid Generation, Spring 2003.  
ENCM 516 - Grid Generation, Fall 2004.  
ENCM 591 - Special Topics in Engineering, “Computational Design Graphics”, Spring 2005.  
ENCM 516 - Grid Generation, Fall 2005.  
ENCM 591 - Special Topics in Engineering, “Adaptive & Dynamic Mesh Generation”, Spring 2006.  
ENCM 516 - Grid Generation, Fall 2006.  
ENCM 591 - Special Topics in Engineering, “Adaptive & Dynamic Mesh Generation”, Spring 2007.  
CPSC 591 – Special Topics in Computer Science, “Advanced Programming for Physical Simulations”, Spring 2007.  
ENCM 516 – Grid Generation, Fall 2007.  
ENCM 590 – Advanced Programming for Physical Simulations, Fall 2007.  
ENCM 716 – Adaptive and Dynamic Mesh Generation, Spring 2008.  
ENCM 516 – Grid Generation, Fall 2008.  
ENCM 590 – Advanced Programming for Physical Simulations, Fall 2008.  
ENCM 716 – Adaptive and Dynamic Mesh Generation, Spring 2009.  
ENCM 516 – Grid Generation, Fall 2009

## AIAA Courses

Grid Generation – Cartesian Methods, AIAA 18<sup>th</sup> Computational Fluid Dynamics Conference, Miami, FL, June 2007 (Cancelled due to low registration)  
Grid Generation – Hybrid Grid Methods, AIAA 18<sup>th</sup> Computational Fluid Dynamics Conference, Miami, FL, June 2007 (Cancelled due to low registration)

## Professional Memberships

Pointwise, Inc. Visiting Researcher, summer 2008.  
Pointwise, Inc. Invited speaker for VINAS User’s Group Meeting, September 2007.  
Committee Member for International Meshing Roundtable, September 2007 – Present.  
Unstructured Grid Generation Consortium  
CFD General Notation System  
International Society of Grid Generation  
NATO/RTO technical team AVT-113 studying viscous vertical flows over F-16XL  
Lockheed Martin Corporate CFD Technology Focal Group  
Lockheed Martin Aeronautics High Performance Computing Team

American Institute of Aeronautics and Astronautics:

- Associate Fellow of American Institute of Aeronautics and Astronautics:
- Chairman AIAA TC Meshing, Visualization & Computational Environments, August 2008 – Present.
- Vice Chairman AIAA TC Meshing, Visualization & Computational Environments, May 2007 – August 2008.
- Session Co-Chairman, 19<sup>th</sup> Computational Fluid Dynamics Conference, San Antonio, TX, June 2009
- Session Co-Chairman, Meshing, Visualization & Computational Environments, 47<sup>th</sup> Aerospace Sciences Meeting and Exhibit, Orlando, FL, January 2009
- Session Co-Chairman, Meshing, Visualization & Computational Environments, 46<sup>th</sup> Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2008
- Session Co-Chairman, 18<sup>th</sup> Computational Fluid Dynamics Conference, Miami, FL, June 2007
- Session Co-Chairman, Meshing, Visualization & Computational Environments, 45<sup>th</sup> Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2007
- Session Co-Chairman, Meshing, Visualization & Computational Environments, 44<sup>th</sup> Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2006
- Session Co-Chairman, 17<sup>th</sup> Computational Fluid Dynamics Conference, Toronto, Canada, June 2005
- Session Co-Chairman, Meshing, Visualization & Computational Environments, 43<sup>rd</sup> Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2005
- Session Chairman, Applied Aerodynamics session, 41<sup>st</sup> Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2003
- Member of Interactive Computer Graphics Technical Committee, January 2003 to Present
- Member of Applied Aerodynamics Technical Committee, Spring 2000 to Spring 2003
- Session Chairman, Applied Aerodynamics Conference, St. Louis, MO, June 2002
- Session Chairman, Applied Aerodynamics session, 40<sup>th</sup> Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2002
- Session Chairman, Applied Aerodynamics session, 38<sup>th</sup> Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2000
- Session Chairman, Applied Aerodynamics Conference, Norfolk, VA, June 1999