

Steve Karman

Education

PhD, Aerospace Engineering, University of Texas at Arlington, 1991, Advisor: Prof. Dale Anderson

MS, Aerospace Engineering, Texas A&M University, May 1982

BS, Aerospace Engineering, Texas A&M University, December 1980

Employment

Software Architect, Cadence Design Systems, April 2021 to June 2021.

Staff Specialist, Applied Research Branch, Pointwise, Inc. December 2014 to April 2021.

Professor, Graduate School of Computational Engineering, University of Tennessee at Chattanooga, July 2009 to December 2014

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.
3. "Development of a 3D Unstructured CFD Method," Ph.D. Dissertation, May 1991, University of Texas at Arlington.
4. "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.
5. "Unstructured Cartesian/Prismatic Grid Generation for Complex Geometries," NASA Conference Publication 3291, "Surface Modeling, Grid Generation, and Related Issues in Computational Fluid Dynamics," 1995.
6. "Mesh Generation Using Unstructured Computational Meshes and Elliptic Partial Differential Equation Smoothing," *AIAA Journal*, Volume 44, Number 6, pp. 1277-1286, June 2006.
7. "Unstructured Viscous Layer Insertion Using Linear-Elastic Smoothing", *AIAA Journal*, Volume 45, Number 1, pp.168-180, 2007.
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.
10. "F-16XL Geometry and Computational Grids Used in Cranked Arrow Wing Aerodynamics Project International," *AIAA Journal of Aircraft*, Vol. 46, No. 2, March-April 2009, pp. 369-376.
11. NATO RTO-TR-AVT-113 Understanding and Modeling Vortical Flows to Improve the Technology Readiness Level for Military Aircraft, Chapter 15, "Numerical Solutions for the CAWAPI Configuration on Unstructured Grids at UT-SimCenter, United States," pp.14-1-36, RTO/NATO, October 2009.
12. "Manipulating Boundaries and Viscous Regions of Unstructured Meshes Using Winslow's Equations", *AIAA Journal*, Volume 50, Number 10, pp. 2080-2090, October 2012.
13. "Adaptive Optimization-Based Improvement of Tetrahedral Meshes," *AIAA Journal*, Vol. 54, No. 5, May 2016, pp. 1578-1590.

14. "Stabilized Finite Elements in FUN3D", AIAA Journal of Aircraft, Vol. 55, No. 2.

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", 26th 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. "Simulation of a Surface Combatant with Dynamic Ship Maneuvers," 9th Int. Conf. in Num. Ship Hydro., University of Michigan, 5-8 Aug. 2007.
17. "Parallel Hierarchical Unstructured Mesh Generation with General Cutting", AIAA -2008-0918, January 2008.
18. "Simulation of Large Amplitude Ship Motions for Prediction of Fluid-Structure Interaction," *Proceedings of the 27th ONR Symposium on Naval Hydrodynamics*, Seoul, Korea, 5-10 October 2008.
19. "Hierarchical Unstructured Mesh Generation with General Cutting for Free Surface Simulations", *Proceedings of the 27th ONR Symposium on Naval Hydrodynamics*, Seoul, Korea, 5-10 October 2008.
20. "Geometry Parameterization Using Control Grids," AIAA 2008-Presented at the 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Victoria, BC, September 10-12, 2008.
21. "Unstructured Elliptic Smoothing Revisited", AIAA-2009-1362, January 2009.
22. "CFD Modeling of F-35 Using Hybrid Unstructured Meshes", AIAA-2009-3662, June 2009.
23. "Virtual Control Volumes for Two-Dimensional Unstructured Elliptic Smoothing", 19th IMR, October 2010.
24. "Virtual Control Volumes for Three-Dimensional Unstructured Elliptic Smoothing", AIAA-2011-893, January 2011.
25. "Fully Anisotropic Split-Tree Adaptive Refinement Mesh Generation Using Tetrahedral Mesh Stitching", AIAA-2011-895, January 2011.
26. "Techniques for Unstructured Mesh Adaptation with Elliptic Smoothing", AIAA-2012-156, January 2012.
27. "A Hybrid Grid Generation Method for Complex Geometries", AIAA-2012-157, January 2012.
28. "Adjoint-Based Design Optimization Using CAD Parameterization Through CAPRI", AIAA-2012-968, January 2012.
29. "Mesh Rupturing: A Technique for Geometry Insertion and Significant Mesh Movement," AIAA Paper 2013-1048, January 2013.
30. "Multi-Block Hierarchical Unstructured Grid Generation with Adaptation", AIAA-2014-0116, January 2014.
31. "Adaptive Optimization-Based Smoothing for Tetrahedral Meshes", AIAA-2015-2038, January 2015.
32. "A Survey of Overset Domain Assembly Methods", AIAA-2015-0910, January 2015.
33. "Advances in Parallelization For Large Scale Oct-Tree Mesh Generation", AIAA-2015-0911, January 2015.
34. "Optimization-Based Smoothing for Extruded Meshes", AIAA-2016-1671, January 2016.
35. "Automatic 2D High-Order Viscous Mesh Generation by Spring-Field and Vector-Adding", AIAA-2016-1673, January 2016.
36. "High-Order Mesh Curving Using WCN Mesh Optimization", AIAA-2016-3178, June 2016.
37. "Mesh Generation Challenges: A Commercial Software Perspective", AIAA-2017-3790, June 2017.
38. "Node Creation for Isotropic Tetrahedral Mesh Generation", AIAA-2017-3450, June 2017.
39. "Results from DoD HPCMP CREATE-AV Kestrel Component COFFE for 3D Aircraft Configurations with High-Order Meshes Generated by Pointwise", AIAA-2017-0970, January 2017.

40. "High Order Meshes for the Geometry and Mesh Generation Workshop I", AIAA-2018-0661, January 2018.
41. "Recent Advances in High-Order Mesh Generation at Pointwise", ICOSAHOM 2018.
42. "Automatic Unstructured Mesh Generation with Geometry Attribution", AIAA-2019-1721, January 2019.
43. "Mixed-Order Curving for Viscous Meshes", AIAA-2019-3317, June 2019.

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
 \$59,109 – Geometry Manipulation & Visualization, Computational Simulation & Design, CoE Appl. Comp. Sci. Engr. (Principal Investigator) 2007-2008
 \$43,359 – Tetrahedral Mesh Creation/Optimization Using Edge/Face Flips, CoE Appl. Comp. Sci. Engr. (Principal Investigator) 2009-2010
 \$43,359 – Unstructured Elliptic Smoothing, CoE Appl. Comp. Sci. Engr. (Principal Investigator) 2009-2010.
 \$44,700 – Unstructured Elliptic Smoothing, CoE Appl. Comp. Sci. Engr. (Principal Investigator) 2010-2011.
 \$20,000 – Analysis and Design of Biological Stent Implants, CoE Appl. Comp. Sci. Engr. (Principal Investigator) 2011-2012.
 \$20,000 – Design of Stent for Bifurcated and Limb Arteries, CoE Appl. Comp. Sci. Engr. (Principal Investigator) 2012-2013.
 \$35,000 – Molecular Dynamics Based Point Generation and Radial Basis Flow Solver, CoE Appl. Comp. Sci. Engr. (Principal Investigator) 2013-2014.
 \$296,319 – Adaptive Meshing of Ship Air-Wake Flowfields, Office of Naval Research, (Principal Investigator) 2013-2016.
 \$21,160 Pointwise – Gridgen Teaching License Program, Yearly
 \$125,000 – High Order Mesh Curving and Geometry Access, Phase I NASA SBIR 2017.
 \$750,000 – High Order Mesh Curving and Geometry Access, Phase II NASA SBIR 2018-2020.

Academic Specialties

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

Commitment to Graduate Education UTC

•	Beasley, James	MS	Graduated 2004
•	Burdyslaw, Chad	PhD	Graduated 2006
•	Mitchell, Brent	MS	Graduated 2007
•	Betro, Vincent	MS (Chair)	Graduated 2007
•	Lange, Kyle	MS	Graduated 2007
•	Jackson, Matthew	MS	Graduated 2008
•	Sahasrabudhe, Mandar	PhD (Chair)	Graduated 2008
•	Lange, Kyle	PhD	Graduated 2009
•	Hilbert, Bruce	MS (Chair)	Graduated 2009
•	Whitt, Justin	MS (Chair)	Graduated 2009
•	Chackasserilvarghese, Jacob	MS (Chair)	Graduated 2009
•	Ellis, Dawn	MS. (Chair)	Graduated 2010
•	Betro, Vincent	PhD (Chair)	Graduated 2010

•	Masters, James	PhD (Chair)	Graduated 2010
•	Ji, Lei	PhD	Graduated 2011
•	Collao, David	MS (Chair)	Graduated 2011
•	Brock, Bill	MS (Chair)	Graduated 2011
•	Druyor, Cameron	MS (Chair)	Graduated 2011
•	O'Connell, Matthew	MS (Chair)	Graduated 2011
•	Szapiro, Nicholas	MS (Chair)	Graduated 2012
•	Sawyer, Shane	MS	Graduated 2012
•	Philip Fackler	MS (Chair)	Graduated 2013
•	Tanis, Craig	PhD	Graduated 2013
•	Cofer, Adam	MS	Graduated 2014
•	Yanon Gong	MS (Chair)	December 2014
•	Hilbert, Bruce	PhD (Chair)	May 2015
•	Druyor, Cameron	PhD (Chair)	August 2016
•	O'Connell, Matthew	PhD (Chair)	August 2016
•	Mittal, Anshul	PhD	May 2016
•	Chambers, Benjamin	MS (Chair)	
•	Liu, Tou	PhD	
•	Fackler, Philip	PhD	

Student Performing Internships/Co-op

•	Druyor, Cameron	NASA Langley
•	O'Connell, Matthew	NASA Langley
•	Shoemake, Lawton	Pointwise, Inc. (Summer 2014)

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 – Speical 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
ENCM 716 – Adaptive and Dynamic Mesh Generation, Spring 2010.
ENGR 1040 – Vector Statics, Fall 2010.
ENCM 5160 – Grid Generation, Fall 2010.
ENCM 7160 – Adaptive and Dynamic Mesh Generation, Spring 2011.
ENCM 5160 – Grid Generation, Fall 2011
ENCM 7160 – Adaptive and Dynamic Mesh Generation, Spring 2012
ENCM 5160 – Grid Generation, Fall 2012
ENCM 7160 – Adaptive and Dynamic Mesh Generation, Spring 2013
ENCM 5160 – Grid Generation, Fall 2013
ENCM 7160 – Adaptive and Dynamic Mesh Generation, Spring 2014
ENCM 5160 – Grid Generation, Fall 2014
ENCM 7160 – Adaptive and Dynamic Mesh Generation, Spring 2014
ENCM 5160 – Grid Generation, Fall 2014
ENCM 7160 – Adaptive and Dynamic Mesh Generation, Spring 2015

AIAA Courses

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

Honors and Awards

Sigma Gamma Tau, National Honor Society for Aerospace Engineering.
Tau Beta Pi, National Honor Society for Engineering.
Pointwise Visiting Research Professor, May 2008.
Pointwise, Inc. Invited speaker for VINAS User’s Group Meeting, September 2007.
AIAA MVCE TC Best Paper 2006, AIAA 2006-0531, "Unstructured Viscous Layer Insertion Using Linear-Elastic Smoothing"
Engineering and Computer Science Research Award, Faculty Honors Day, University of Tennessee at Chattanooga, April 16, 2009.
Nominated for AIAA MVCE TC Best Paper Award 2011, AIAA 2011-893, "Virtual Control Volumes for Three-Dimensional Unstructured Elliptic Smoothing"

Engineering and Computer Science Teacher Award, Faculty Honors Day, University of Tennessee at Chattanooga, April 2012.

Banquet Speaker for International Meshing Roundtable, October 2010, Chattanooga, TN.

Professional Memberships

Organizing Committee Member for International Meshing Roundtable, September 2007 – 2009.

Steering Committee International Meshing Roundtable, 2020 - 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 – April 2010.
- Vice Chairman AIAA TC Meshing, Visualization & Computational Environments, May 2007 – August 2008.
- Session Co-Chairman, Meshing, Visualization & Computational Environments, 51st Aerospace Sciences Meeting and Exhibit, Grapevine, TX, January 2013
- Session Co-Chairman, 19th Computational Fluid Dynamics Conference, San Antonio, TX, June 2009
- Session Co-Chairman, Meshing, Visualization & Computational Environments, 47th Aerospace Sciences Meeting and Exhibit, Orlando, FL, January 2009
- Session Co-Chairman, Meshing, Visualization & Computational Environments, 46th Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2008
- Session Co-Chairman, 18th Computational Fluid Dynamics Conference, Miami, FL, June 2007
- Session Co-Chairman, Meshing, Visualization & Computational Environments, 45th Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2007
- Session Co-Chairman, Meshing, Visualization & Computational Environments, 44th Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2006
- Session Co-Chairman, 17th Computational Fluid Dynamics Conference, Toronto, Canada, June 2005
- Session Co-Chairman, Meshing, Visualization & Computational Environments, 43rd Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2005
- Session Chairman, Applied Aerodynamics session, 41st Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2003
- Member of Fluid Dynamics Technical Committee, May 2015 to present.
- Co-Technical Chair for Fluid Dynamics TC for AIAA SciTech 2017 Conference.
- Member of Interactive Computer Graphics Technical Committee, January 2003 to May 2015.

- 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, 40th Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2002
- Session Chairman, Applied Aerodynamics session, 38th Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2000
- Session Chairman, Applied Aerodynamics Conference, Norfolk, VA, June 1999