Stuart A. Craig

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1 Experience

University of Arizona
Deputy Director, Arizona Research Center for Hypersonics 2022–present
Assistant Professor, Aerospace & Mechanical Engineering 2016–present

Los Alamos National Laboratory
Guest Scientist, Physics Division P-23 2016–2017
Postdoctoral Research Associate, Physics Division P-23 2015–2016

2 Education

Ph.D.	Aerospace Engineering, Texas A&M University	2015
B.S.	Mechanical Engineering, University of Illinois at Urbana-Champaign	2009

3 Research Interests

Boundary-layer stability and transition, hydrodynamic instability, experimental fluid mechanics, incompressible and compressible fluid dynamics, hypersonic flows, aerodynamic heating

4 Honors and Awards

Panel Excellence Award, NATO STO AVT-240 2019

Member, AIAA Fluid Dynamics Technical Committee 2019–present

Office of Naval Research (ONR) Young Investigator Award 2018

5 Service and Outreach

5.1 Memberships

American Institute of Aeronautics and Astronautics (AIAA), Senior Member 2009–present

- Fluid Dynamics Technical Committee (FDTC) 2019–present
  - FDTC liaison to *AIAA Journal* 2021–present
- AIAA SciTech Conference
  - Session Chair 2020
  - Abstract Reviewer 2020, 2021, 2022
- AIAA Aviation Conference

Session Chair	2019, 2020, 2022
Abstract Reviewer	2019, 2020, 2021, 2022
National Defense Industrial Association (NDIA), Corporate Member	2019–present
American Physical Society (APS), Member	2011–2018
APS Division of Fluid Dynamics (DFD) Meeting Co-organizer	2021
APS DFD Gallery of Fluid Motion Judge	2017
NATO STO AVT-346 Working Group, Member	2020–present
Fall meeting organizer and host	2022
NATO STO AVT-240 Working Group, Member	2012–2019

5.2 Journal referee

Journal of Fluid Mechanics	*Journal of Spacecraft and Rockets*
Physics of Fluids	*Experiments in Fluids*
AIAA Journal	*Experimental Thermal and Fluid Science*

6 Publications

6.1 Peer-reviewed journal articles

Craig SA. (2022, under review) "A tip sharpness criterion for hypersonic wind tunnel experiments." *AIAA J.*

Bearden KP, Padilla VE, Taubert L, Craig SA. (2022, in press) "Calibration and performance characterization of a Mach 5 Ludwieg tube." *Rev. Sci. Instr.*

Craig SA, Humble RA, Hofferth JW, Saric WS. (2019) "Nonlinear behaviour of the Mack mode in a hypersonic boundary layer." *J. Fluid Mech.* **872**, 74–99. doi:10.1017/jfm.2019.359.

Kocian TS, Moyes AJ, Reed HL, Craig SA, Saric WS, Schneider SP, Edelman JB. (2018) "Hypersonic crossflow instability." *J. Spacecr. Rockets.* doi:10.2514/1.A34289.

Craig SA, Saric WS. (2016) "Crossflow instability in a hypersonic boundary layer." *J. Fluid Mech.* **808**, 224–244. doi:10.1017/jfm.2016.643.

Craig SA, Saric WS. (2015) "Crossflow instability on a yawed cone at Mach 6." *Procedia IUTAM.* **14**. 15–25. doi:10.1016/j.piutam.2015.03.019.

Humble RA, Craig SA, Vadyak J, McClure PD, Hofferth JW, Saric WS. (2013) "Spatiotemporal structure of a millimetric annular dielectric barrier discharge plasma actuator." *Phys. Fluids.* **25**, 017103 (2013). doi:10.1063/1.4774334.

6.2 Conference proceedings

Threadgill JAS, Jouannais L, Hader C, Flood JT, Craig SA, Fasel HF, Little JC. (2022) "Fin-Induced Shock/Boundary-Layer Interaction on a Cylindrical Body with Different Boundary Layer States." *AIAA SciTech 2022. AIAA 2022-1816.* doi:10.2514/6.2022-1816.

Singh A, Threadgill JAS, Flood JT, Craig SA, Little JC, Hader C, Fasel HF. (2021) "Development of Plasma-based Controlled Disturbances for the Study of Boundary Layer Transition and Shock Boundary Layer Interaction." *AIAA Aviation 2021. AIAA 2021-2822.* doi:10.2514/6.2021-2822.

Bearden KP, Padilla VE, Taubert L, Craig SA. (2021) "Calibration of a Mach 5 Ludwieg tube at the University of Arizona." *AIAA Aviation 2021. AIAA 2021-2950.* doi:10.2514/6.2021-2950.

Maldonado JC, Threadgill JAS, Craig SA, Little JC, Wernz S. (2021) "Flow Structure and Heat Transfer Characterization of a Blunt-Fin-Induced Shock-Wave/Laminar Boundary-Layer Interaction." *AIAA SciTech 2021. AIAA 2021-0748.* doi:10.2514/6.2021-0748.

Flood JT, Taubert L, Craig SA. (2020) "First and Mack-mode instabilities in a flat-plate boundary layer at Mach 4." *AIAA SciTech 2020. AIAA 2020-0361.* doi:10.2514/6.2020-0361.

Flood JT, Taubert L, Craig SA. (2020) "Flow Quality Mapping of the Mach 4 Quiet Ludwieg Tube." *AIAA SciTech 2020. AIAA 2020-0360.* doi:10.2514/6.2020-0360.

Flood JT, Taubert L, Craig SA. (2019) "Initial Flow Quality of the Mach 4 Quiet Ludwieg Tube." *AIAA Aviation 2019. AIAA 2019-3220.* doi:10.2514/6.2019-3220.

Kocian TS, Moyes AJ, Reed HL, Craig SA, Saric WS, Schneider SP, Edelman JB. (2018) "Hypersonic crossflow instability." *AIAA SciTech 2018. AIAA 2018-0061.* doi:10.2514/6.2018-0061.

Craig SA, Saric WS. (2015) "Experimental study of crossflow instability on a Mach 6 yawed cone." *AIAA Aviation 2015. AIAA 2015-2774.* doi:10.2514/6.2015-2774.

Craig SA, Humble RA, Saric WS. (2011) "Characterization of the Flowfield Structure of an Annular Dielectric Barrier Discharge Plasma Actuator." *41st AIAA Fluid Dynamics Conference and Exhibit. AIAA 2011-3987.* doi:10.2514/6.2011-3987.

6.3 Invited talks

"Boundary-layer stability and transition experiments at the University of Arizona." Seminar, The Boeing Company, St. Louis, MO, March 2019.

"High-speed stability and transition experiments at the University of Arizona." Department Seminar, New Mexico State University, Las Cruces, NM, April 2017.

"High-speed stability and transition experiments at the University of Arizona." NASA Langley Research Center, Hampton, VA, March 2017.

"Boundary-layer stability and transition experiments at the University of Arizona." Seminar, Aeronautics & Astronautics, Purdue University, West Lafayette, IN, February 2017.

6.4 Conference presentations

Little JC, Craig SA. (2022) "High-speed wind tunnels and applied research at UArizona." *AIAA Defense 2022.* Laurel, MD.

Craig SA, Little JC, Wernz S. (2021) "Aerodynamic heating experiments and computations around swept fins at Mach 4." *AIAA Defense 2021.* Laurel, MD.

Flood J, Craig SA. (2018) "An update on the University of Arizona wind tunnels." *AIAA Aviation 2018, Transition Open Forum.* Atlanta, GA.

Craig SA. (2017) "High-speed quiet tunnels at the University of Arizona." *AIAA Aviation 2017, Transition Open Forum.* Denver, CO.

Craig SA, Mejia-Alvarez R, Wilson BM, Prestridge KP. (2015) "Richtmyer-Meshkov mixing: experiments on the effect of initial conditions." *68th Annual Meeting of the APS Division of Fluid Dynamics.*

Mejia-Alvarez R, Wilson BM, Craig SA, Prestridge KP. (2015) "Experimental study of Mach number effects on the evolution of Richtmyer-Meshkov instabilities." *68th Annual Meeting of the APS Division of Fluid Dynamics.*

Craig SA, Saric WS. (2015) "Experimental study of the crossflow instability on a hypersonic yawed cone in the Mach 6 Quiet Tunnel at Texas A&M University." *NATO STO AVT-240 & RTG-082: Hypersonic Boundary-Layer Transition Prediction.* Tucson, AZ.

Craig SA, Saric WS. (2014) "Experimental study of crossflow instability on a Mach 6 yawed cone." *67th Annual Meeting of the APS Division of Fluid Dynamics.*

Craig SA, Saric WS. (2014) "Crossflow instability on a yawed cone at Mach 6." *Eighth IUTAM Symposium on Laminar-Turbulent Transition.* Rio de Janeiro, Brazil.

Craig SA, Saric WS. (2014) "Crossflow instability on a yawed cone at Mach 6." *44th AIAA Fluid Dynamics Conference and Exhibit, Transition Open Forum.* Atlanta, GA.

Craig SA, Humble RA, Hofferth JW, Saric WS. (2011) "Flow-field characterization of DBD plasma actuators as discrete roughness elements for laminar flow control." *64th Annual Meeting of the APS Division of Fluid Dynamics.*

7 Sponsored Projects

7.1 Active

"Deep Learning Framework for Rapid Deployment of Autonomous Hypersonic Strike Weapons," UCAH (sub-JHTO), Role: co-PI, 14%, Period: 3 yr. TBD, Amount: $5,000,000

"Hypersonic Ground Test Infrastructure," MSRDC (sub-TRMC), Role: PI, 50%, Period: 3 yr. 12/2021–11/2024, Amount: $6,500,000

"Hypersonic Infrastructure Upgrades," AZ State Appropriations, Period: FY22, FY23, Amount: $5,800,000

"Leading Edge Cooling for Hypersonic Vehicles," STTR Phase II, Venus Aerospace (sub-AFOSR), Role: PI, 50%, 07/2021–09/2022, Amount: $251,255

"Hypersonic Waverider Testing," Venus Aerospace IRAD, Role: PI, 50%, Amount: $35,301

"Fusion of Multi-fidelity Experimental Experimental and Computational Data for the Construction and Enrichment of a Surrogate Aerodynamic Database," UCAH (sub-JHTO), Role: co-PI, 16%, Period: 12/2021–11/2024, Amount: $1,500,000

"Experimental Study of the Effect of Nose Bluntness on Hypersonic Boundary-Layer Transition," AFOSR, FA9550-21-1-0363, Role: PI, 100%, Period: 08/2021–08/2024, Amount $449,900

"Investigation of 3D Shockwave Boundary Layer Interaction and Related Phenomena for the STORT Flight Program," AFOSR, FA9550-21-1-0018, Role: co-PI, 31%, Period: 2020–2023, Amount: $1,017,682

"A comprehensive investigation of transitional shock boundary layer interaction using experiments, simulations, and stability theory." ONR, N00014-20-1-2267, Role: co-PI, 33%, Period: 04/2020–03/2023, Amount: $600,106

"A Mach 5, quiet wind tunnel nozzle for hypersonic transition research." DoD HBCU/MI REP Program, W911NF1910528, Role: PI, 100%, Period: 2019–2022, Amount: $446,403

7.2 Past

"A constant-temperature anemometer for off-body measurements in a hypersonic wind tunnel," DURIP ONR, N00014-21-1-2852, Role: PI, 100%, Period: 08/2021–07/2022, Amount: $192,064

"Secondary instability of hypersonic crossflow vortices," ONR YIP, N00014-18-1-2500, Role: PI, 100%, Period: 06/2018–11/2021, Amount: $637,520

"A MEMS-based pressure-sensor array for hypersonic boundary-layer pressure measurements." AFOSR, FA9550-20-1-0180, Role: PI, 100%, Period: 07/2020–07/2021, Amount: $125,065

"High-Speed Flow Sensing and Control," Raytheon IRAD, Role: co-PI, 50%, Period: 09/2020 – 12/2020, Amount: $40,000

"Nonlinear interaction between first- and Mack-mode instabilities in high-supersonic flows," ONR, N00014-17-1-2340, Role: PI, 100%, Period: 04/2017–03/2021, Amount: $559,180

"Prediction of Boundary-Layer Transition on Hypersonic Vehicles in Large-Scale Wind Tunnels and Flight." SBIR Phase II, Arizona Engineering Science, LLC (sub-AFOSR), Role: PI, 100%, Period: 06/2018–03/2020, Amount: $149,777

"A focusing schlieren system for the measurement of high-frequency, 3D boundary-layer instabilities," ONR, N00014-18-1-2385, Role: PI, 100%, Period: 06/2018–05/2019, Amount: $109,400

Last updated: July 12, 2022