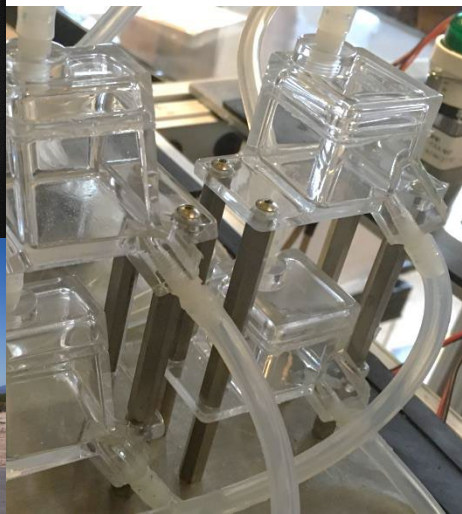
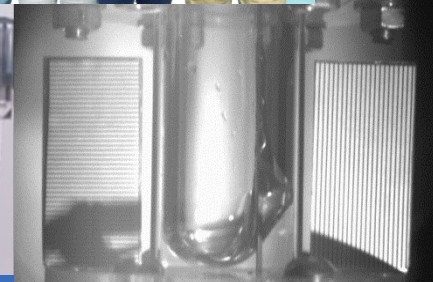
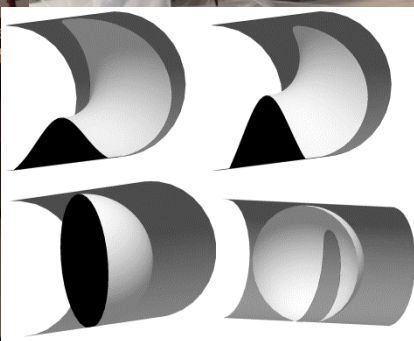
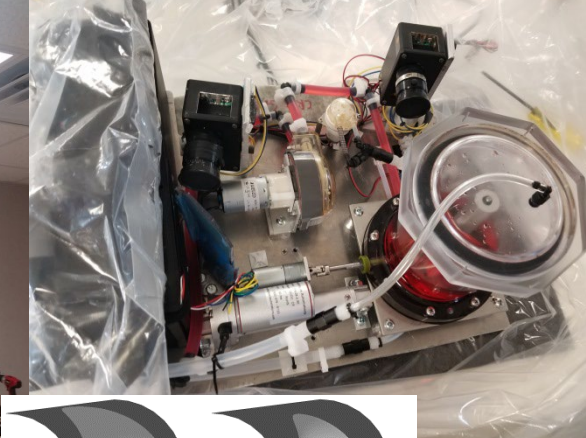


Steven Collicott, July 2022 Career Overview

Zero-g Experimentation Experiences, 1997 to date

- December 2021: Selected by NASA as the first professor to perform research on commercial sub-orbital spaceflight.
- 7 fluids payloads on 5 Blue Origin New Shepard commercial sub-orbital flights
- 45 payloads on NASA and Zero-G Corp. parabolic aircraft flights, mostly fluids experiments
- 2 fluids test vessel geometries designed for the highly successful Vane Gap fluids payloads in ISS.
- 5 spacewalk tool prototypes tested in NASA's Neutral Buoyancy Lab
- Advised Dr. Mo Kassemi, Director of the National Center for Space Exploration Research, on important changes to NASA's ZBOT tank geometry, thus enabling highly successful ZBOT operations in orbit in 2018.
- Advised industry on 1 commercial ISS payload recently operated in ISS.
- 1 fluids payload on UpAerospace Spaceloft launch, second payload delivered November, 2020
- Fluids payloads launched on 7 Armadillo Aerospace sub-orbital mission attempts
- Sensor payload launched on 3 Exos Aerospace sub-orbital mission attempts, #4 soon.
- 2 payloads designed, 1 built, for XCor Aerospace sub-orbital missions
- 1 fluids payload completed, 1 heat transfer payload begun for Masten Space Systems flights.
- 2 fluids payload begun for Virgin Galactic flights.
- Advised on two-phase fluids separator design for the successful CCF experiment in space station.
- Drop tower experiments to solve fluids issues, reducing required astronaut time, for an ISS animal habitat.
- Built and operated 2 drop towers at Purdue for zero-g fluids experiments.
- Flying as Research Coach with ZeroG for parabolic aircraft missions.



Zero-g Industrial Experiences

- Gravity Probe-B main helium dewar bubble positioning tests and modeling, 1994. Validated by performance on orbit.
- The first accurate propellant mass center position history throughout the mission for profitable Lockheed Martin A-2100 commercial communications satellites. 1998.
- First computation of propellant mass center shifts during stationkeeping burns in Lockheed-Martin communications satellites, c. 2000.
- Developed thermal propellant gauging system with Lockheed Martin Commercial Space Systems, 1998. Validated on orbit numerous times
- Delivered thermal propellant gauging for GEO satellites with LM, Comsat Technical Services, and YSPM. 1998 to date.
- Developed thermal re-balancing of fuel in multi-tank satellites with Lockheed-Martin. Validated by profitable lifetime extensions of actual commercial satellites in orbit.
- Created and deliver, to industry and NASA, a 2-day short course on using the *Surface Evolver* computer code for practical tank and PMD modeling and analysis.
- Consulting for numerous industrial clients and NASA on propellant management problems. Disclosure of commercial client names is generally prohibited. 1998 to date.

Lockheed Martin
LM2100 Satellite

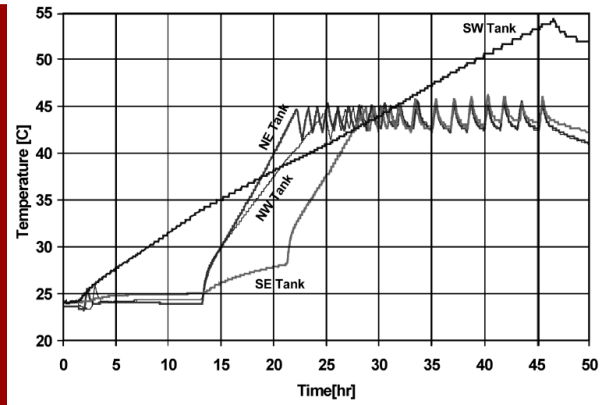
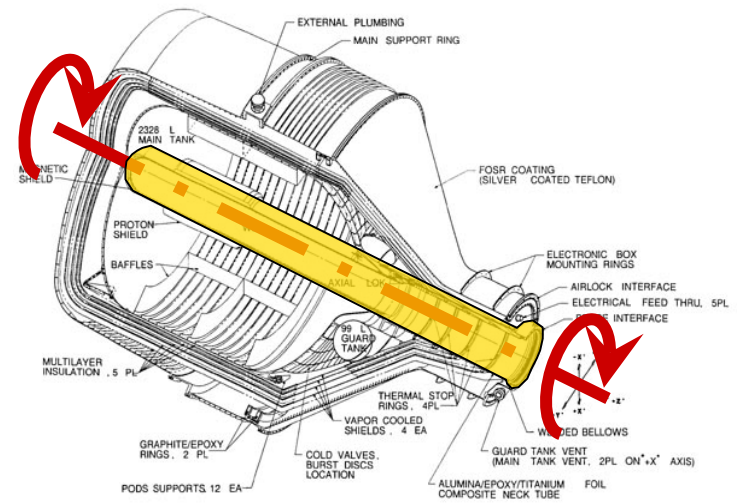
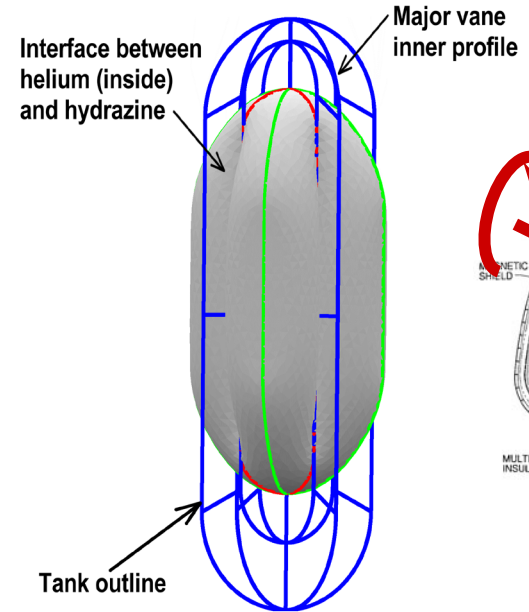
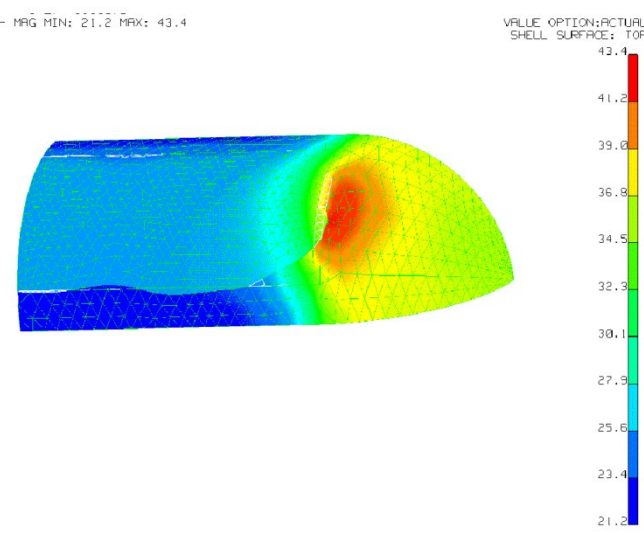


Fig. 3 PGS measurement conducted without temperature change control (data from on-orbit).



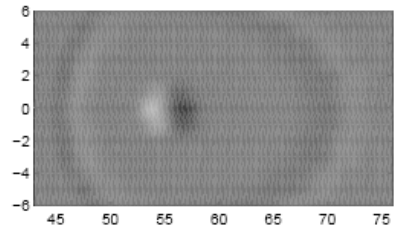
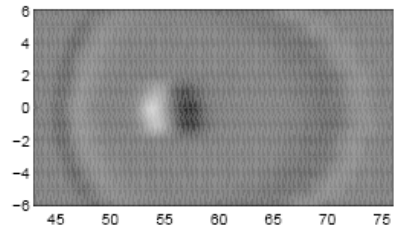
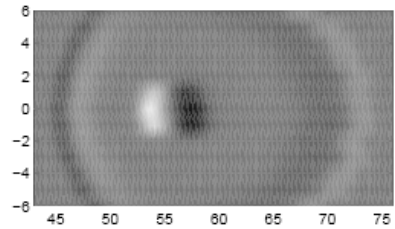
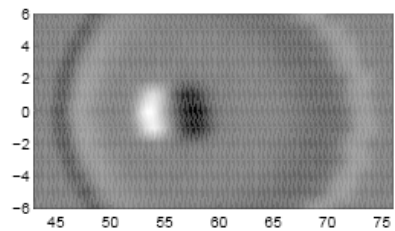
1-g Two-Phase Fluids Experiences

- World's first true-scale (200 micron), true pressure (206 MPa) visualization of unsteady cavitation inside diesel fuel injector orifices, 1997. NSF CAREER award research with Cummins collaboration.
- Oil sump research and design, 1999 to 2006. Teamed with industry sponsor to solve a major oil flow problem in what has since become a ubiquitous and highly dependable turbofan engine in the global regional jet market. This work also generated the knowledge for the sponsor to design the successful oil system in the F-35B Joint Strike Fighter lift fan used for every vertical take-off and landing.

Plus, aerodynamics impact:

- Developed the laser-perturber for hypersonic boundary layer receptivity and stability experiments in Purdue's world-leading hypersonic quiet-flow tunnels.
- Developed the ultra-high sensitivity laser differential interferometer for measuring wave growth non-intrusively in hypersonic boundary layers on realistic flight geometries in Purdue's world-leading hypersonic quiet-flow wind tunnels.

vertical position of spot [mm]

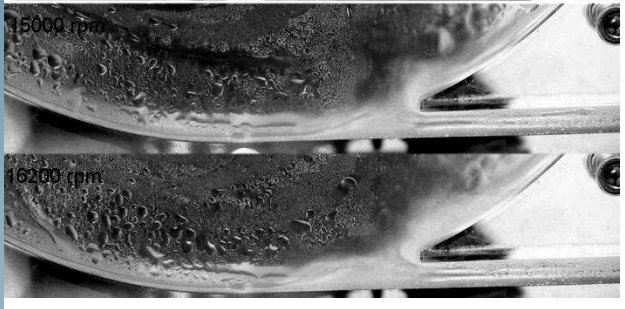
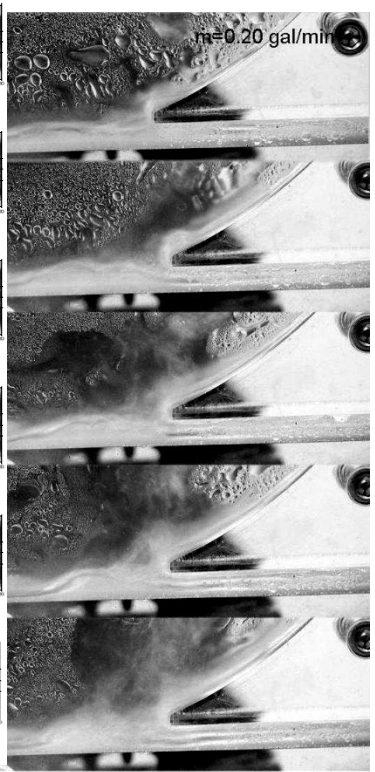
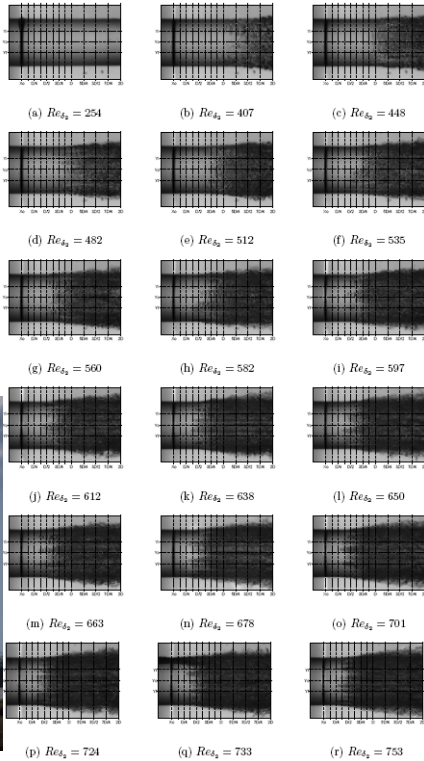


adjusted time from laser firing [μs]



optical path difference [nm]

14000 rpm, 0.15 gpm



Professional Service

- President, American Society for Gravitational and Space Research, Nov. 2021 to Oct. 2022
 - Preceded by one year as President-elect, to be followed by a year as ASGSR conference organizer
- Chair of SARG: Sub-orbital Applications Researchers Group of the Commercial Spaceflight Federation (CSF), June 2013 to May 2022.
 - Advocate in legislative and executive branches of US government, plus NASA and the FAA, for increasing science and education uses of the new generation of low-cost readily-available commercial re-usable sub-orbital rockets.
 - Advertise in the science community to expand awareness of these new opportunities.
 - Partner to manage technical program for Next-gen Sub-orbital Researchers Conferences, March 2020 is the 7th.
- Committee on Biological and Physical Sciences in Space, National Academies. 2016 to date.
 - Advise NASA BPS (was: SLPSRA) on research priorities and paths
 - Helped oversee mid-decade review of decadal plan, now we're moving into the next decadal review.
 - Aid in planning for NASA research in the post-ISS era
- Science and Technology Advisory Panel, ISS-National Labs/CASIS. April 2013 to October 2020.
 - Advise on the use of national labs in space station for impacting life on Earth.
 - Aided in creation of joint ISS-NL and NSF fluids and combustion funding opportunity for space station experiments. 2016 to date.
 - Review research proposals for ISS-NL/CASIS.
- Chair, AIAA Microgravity and Space Processes Technical Committee, 2015 to 2019.
 - Increase participation in TC, increase awareness of new opportunities
 - Oversee biennial Space Processing technical award process.
- Invited Testimony, U.S. Senate Sub-committee on Science and Space. Senators Bill Nelson (FL) and Ted Cruz (TX) presiding. May, 2013.
- Awarded College of Engineering's award for faculty excellence in Engagement, May 2021.

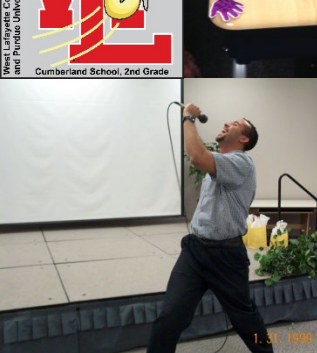
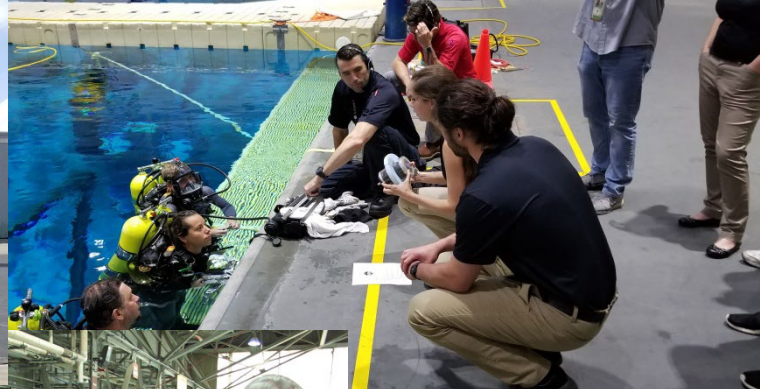


Unique Teaching

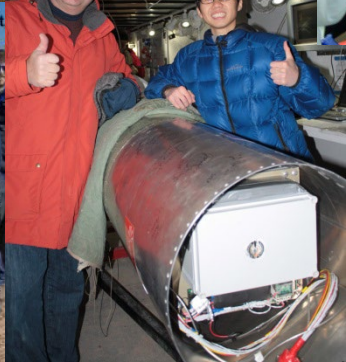
- Started what became “AAE418 Zero-gravity Flight Experiment” in 1996 in response to student interest in NASA’s then-new “Reduced Gravity Student Flight Opportunity Program” or RGSFOP.
 - This design-build-test class grew to 4 experiments winning per year in the competitive proposal program and then flying in parabolic aircraft flights for zero-g experimentation.
 - In 2009 I added commercial sub-orbital payloads.
 - 2014 was the last NASA RGSFOP flight when NASA closed their Reduced Gravity Office.
 - First Blue Origin launch in summer 2016, thanks to Blue Origin and NSF.
 - I have secured over \$8M of aircraft and rocket flights for AAE students. Plus 5 days in NASA’s NBL.
 - Now 60 juniors and seniors per semester, plus 30 in the summers. Over 1,100 students since 1996.
- Recognition:
 - Commercial Spaceflight Federation’s inaugural “Patti Grace Smith STEM Award” winner in 2019.
 - Awarded the college’s Advising Award in 2011
 - Inducted into Purdue’s “Book of Great Teachers” in 2008
 - Awarded the department’s teaching award in 1992
- Created “AAE190 Introduction to Aerospace Engineering” in 1994 to increase enrollment in AAE. 3-year enrollment in AAE then was 140, now in 2019 it is over 800.
 - Lab tours, airport and aircraft tours, interactive classroom experiences, and hands-on team-based experiential learning activities were created for this class.
 - Attracted 120 students for 4 years and AAE enrollment increased such that AAE190 was dropped.
 - 120-page course notes created for this class in 1994. Several chapters are still in use in other classes.



Zero-Gravity Glow Experiment
West Lafayette Community Schools
Purdue University
Cumberland School, 2nd Grade



Purdue team and others after the successful Blue Origin New Shepard rocket flight
December 12, 2017



2. 12. 2001

Steven Collicott, July 2022 Career Overview

Career Path

Degrees

- Ph.D., Stanford University, June 1984 to January 1991. Thesis title: “Speckle Velocimetry with Photorefractive Recording and Anamorphic Optical Processing,”
 - Advisor: Lambertus Hesselink, Department of Aeronautics and Astronautics
- M.S., Stanford University, Department of Aeronautics and Astronautics, September 1983 to June 1984.
- B.S.A.E., University of Michigan, September 1979 to May 1983.

Positions at Purdue

- Professor, School of Aeronautics and Astronautics, August 14, 2006 to date.
- Associate Head for Engagement, School of Aeronautics and Astronautics, August 2015 to August 2020.
- Associate Professor, School of Aeronautics and Astronautics, August 11, 1996 to August 13, 2006.
- Assistant Professor, School of Aeronautics and Astronautics, January 2, 1991 to August 10, 1996.

Positions at other institutions or organizations

- President, Capstan Aerospace, LLC. West Lafayette, IN. 2013 to date, Satellite propulsion system consultant, 1998 to date.
- Research planning in “More-electric” aircraft topics, Rolls Royce Corporation, Indianapolis, IN. January 2, 2006 to June 30, 2006. Sabbatical and summer employment
- Propulsion Specialist, Lockheed Martin Commercial Space, Sunnyvale, California. January 1998 to May 1998. Sabbatical.
- Summer Faculty Fellow, United States Air Force, Wright Laboratories, Dayton, Ohio. May 1992 to July 1992.