UTIAS Overview

David W Zingg
Canada Research Chair (Tier I) in Computational Aerodynamics and Environmentally-Friendly Aircraft Design
UTIAS Director
Professor
<dwz@oddjob.utias.utoronto.ca>
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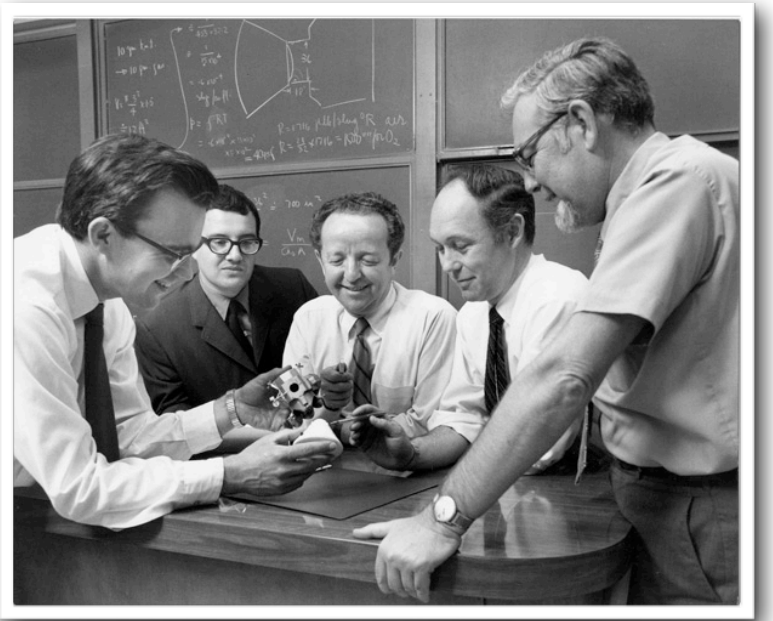
UTIAS: Excellence in Research and Education

- Recently awarded the Pioneer Award from the Canadian Air & Space Museum for its part in the rescue of Apollo 13
- Faculty have won numerous national and international awards, including three Members of the Order of Canada, Guggenheim Fellow, 2014 AIAA Guidance, Navigation, and Control Award, numerous McCurdy Awards, Fellow of the Canadian Academy of Engineering, etc.
- Graduates play an important role in Canada's aerospace sector (e.g. one-third of Core Engineering at Bombardier-Toronto
- UTIAS graduates recently won Sikorsky Prize (human-powered helicopter)
- University of Toronto Engineering Faculty ranked 18th in world in 2012 THE rankings (highest ranked Canadian university)
- UTIAS ranked among top 5 public aerospace departments in North America

UTIAS, located in North end of Toronto



rescuing Apollo 13

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2012 THE World Rankings in Engineering & Technology (10-20)

10. Imperial College London, United Kingdom

11. Georgia Institute of Technology, United States

12. Carnegie Mellon University, United States

13. University of Texas at Austin, United States

14. University of Michigan, United States

15. Cornell University, United States

16. University of California Santa Barbara, United States

17. University of Illinois at Urbana Champaign, United States

18. University of Toronto, Canada

19. National University of Singapore, Singapore

20. École Polytechnique Fédérale de Lausanne, Switzerland

UTIAS: Overview

- Director - Professor David Zingg
- 19 full-time faculty members
- Undergraduate teaching
  - *Aerospace Option of Engineering Science Program (~30 graduating students)*
- Graduate program
  - *72 M.A.Sc., 64 Ph.D., 38 M.Eng. students*
  - *174 total graduate students ~18% women*
- Advanced research in aeronautics and space
- Focus on core aerospace disciplines
- Strong partnerships with the Canadian aerospace industry
- Pursuing global academic and industry partnerships

first human-powered ornithoptor (2010)

MOST microsatellite (2003)

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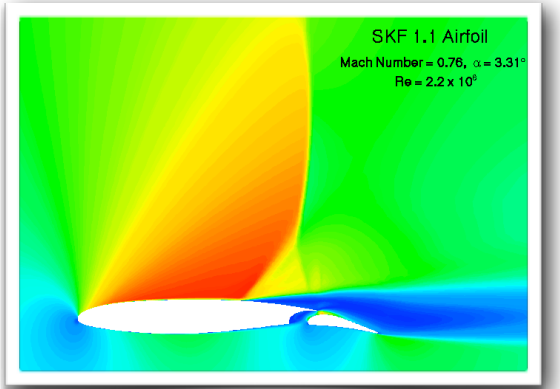
UTIAS: Research Overview

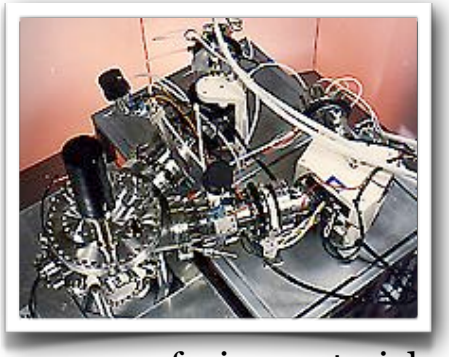
- Aircraft flight systems, flight dynamics, and simulation
  - *Professors Grant, Liu*
- Aerodynamics, fluid dynamics, and propulsion
  - *Professors Ekmekci, Gottlieb, Groth, Gülder, Lavoie, Steinberg, Zingg*
- Materials, structures, and multidisciplinary optimization
  - *Professors Nair, Steeves*
- Space systems engineering
  - *Professors Barfoot, D'Eleuterio, Damaren, Kelly, Schöllig, Zee, Dr. Emami*
- Fusion
  - *Professors Haasz, Stangeby, Dr. Davis*



computational fluid dynamics


ornithoptor


planetary rover


fusion materials

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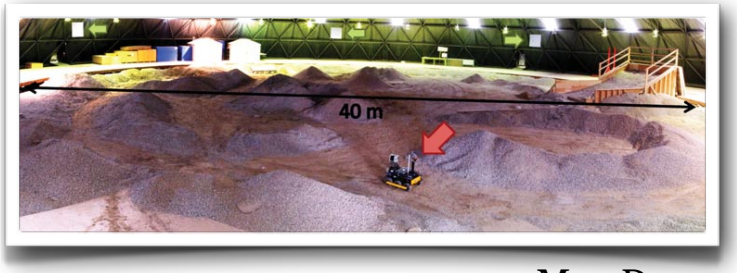
UTIAS: Facilities

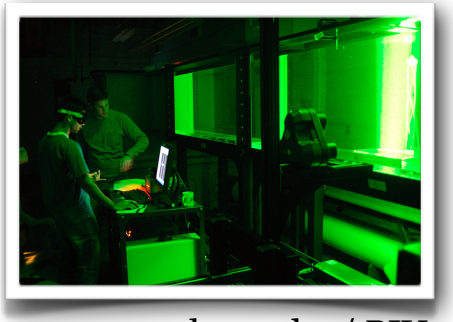
- SciNet Supercomputer: 30,240 cores, 28th in world
- Flight simulator with 6 DOF motion base
- Fixed-base flight simulator; static formation flight experiment UAVs
- Large-scale recirculating water channel; PIV, V3V
- Generic burners for laminar and turbulent flames, high pressure combustion chamber (up to 100 atm), high-pressure blow-down facility for gas turbine combustion research ($5M), high-repetition-rate laser measurement systems for flow and combustion
- Low-turbulence low-speed wind tunnel
- Mobile robot testing facilities instrumented with high-speed camera system; full-scale uneven terrain capability
- Space flight laboratory: supports complete development cycle from conception to spacecraft-level testing



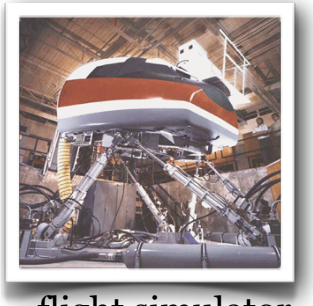
MarsDome


SciNet


UAV


water channel w/ PIV


wind tunnel


flight simulator

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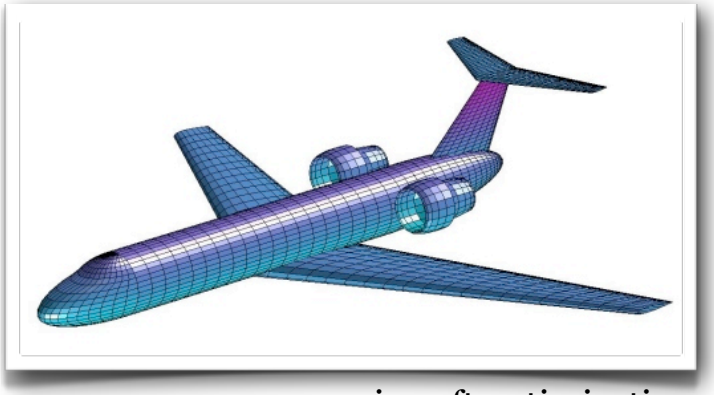
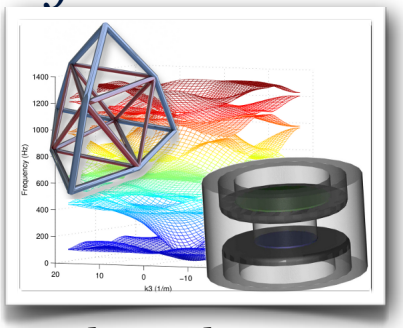
UTIAS: Key Strategic Directions

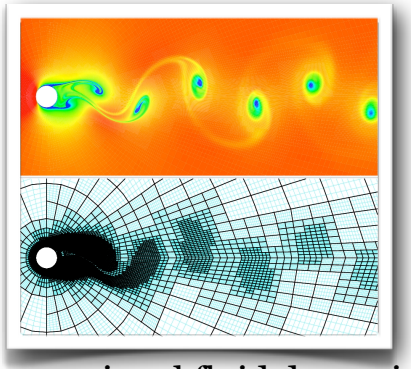
- Reducing the impact of aviation on the environment
  - *unconventional aircraft design for low emissions*
  - *high-fidelity aerodynamic and multidisciplinary optimization*
  - *advanced flow control techniques*
  - *new lightweight multifunctional materials*
  - *low emissions combustors, biofuels*
  - *airframe noise reduction (landing gear)*
- Space exploration
  - *unmanned autonomous robotic systems*
  - *micro and nano-satellites*



aircraft optimization



advanced structures



computational fluid dynamics

rover navigation

lunar excavation

nano-satellite launch

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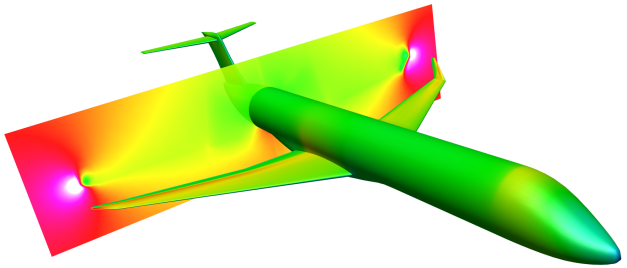
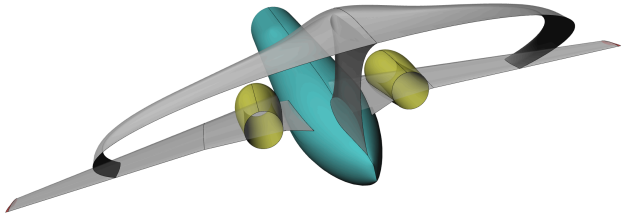
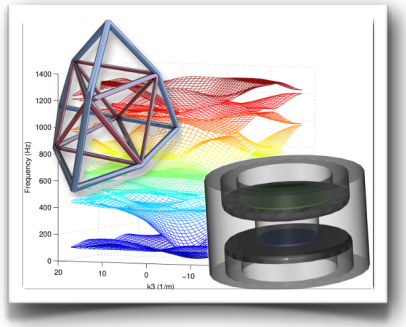
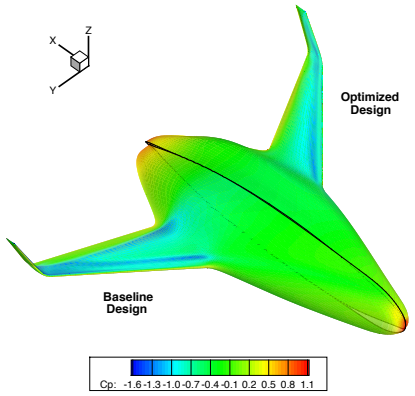
Centre for Research in Sustainable Aviation

- Research toward new technologies to reduce the environmental impact of aviation
  - *research topics include those on previous slide plus collaborations with Chemical and Civil Engineering*
  - *international partners*
  - *regular workshops, colloquia, and short courses*
  - *industry internships*
- Educating a group of students with a unique background in environmentally sustainable aviation
  - *broad range of topics, from atmospheric physics to emissions trading systems*
  - *taught by researchers and practitioners*









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International Partnerships and Collaboration

- MOUs with:
  - *Tohoku University, Japan*
  - *Shanghai Jiao Tong University, China*
  - *Beihang University, China*
- Considerable international research collaboration covered on following slides

International Research Collaborations I

- *NASA, USA*
- *EADS/Airbus, EU*
- *DLR, Germany*
- *Sandia National Laboratory, USA*
- *Georgia Institute of Technology, USA*
- *Beijing Institute of Technology, China*
- *GE Global Research, USA*
- *Imperial College, UK*
- *University of Southampton, UK*
- *ETH Zurich, Switzerland*
- *Princeton University, USA*
- *Oxford University, UK*

International Research Collaborations II

- *Charles Stark Draper Laboratory, USA*
- *Massachusetts Institute of Technology, USA*
- *University of Klagenfurt, Austria*
- *Carnegie Mellon University, USA*
- *University of Wyoming, USA*
- *University of Flinders, Australia*
- *University of Michigan, USA*
- *University of Warwick, UK*
- *Queensland University of Technology, Australia*
- *University of Vienna, Austria*
- *Michigan State University, USA*
- *Graz University of Technology, Austria*

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International Research Collaborations III

- *Norwegian Space Center, Norway*
- *Indian Space Research Organization, India*
- *Space Research Center, Polish Academy of Sciences, Poland*
- *SPACE-SI, Slovenia*
- *Federal Aviation Administration (FAA), USA*
- *Keck Institute for Space Studies, USA*
- *California Institute of Technology, USA*
- *Catalonia Polytechnic University, Spain*
- *CNRS Orleans, France*
- *University of Adelaide, Australia*
- *Leibniz University Hannover, Germany*

Thanks!

Questions?

Director: Prof. David Zingg
dwz@oddjob.utias.utoronto.ca
http://utias.utoronto.ca

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