Samuel W. Albert, PhD

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Education

PhD **University of Colorado Boulder**, Aerospace Engineering Sciences — Boulder, CO
Advisor: Dr. Hanspeter Schaub, Dr. Robert D. Braun — May 2020 – Sept 2023

- *Aerocapture, Entry, and Co-Delivery in Uncertain Planetary Atmospheres*
- NASA Space Technology Research Fellow
- Five first-author papers in peer-reviewed journals
- John A. Vise Award

MS **University of Colorado Boulder**, Aerospace Engineering Sciences — Boulder, CO
Aug 2018 – May 2020

- Graduate Certificate in Astrodynamics and Satellite Navigation Systems
- Matthew Isakowitz Fellow

BS **Purdue University**, Aeronautical and Astronautical Engineering — West Lafayette, IN
Honors College Graduate — Aug 2014 – May 2018

- Minor: Global Engineering Studies
- Exchange semester at Universidad de Carlos III, Madrid, Spain
- Stamps Scholar (full-ride scholarship)

Experience

Johns Hopkins University Applied Physics Laboratory, Senior Aerospace Engineer — Laurel, MD
Director's Special Achievement Award, 2025 — Oct 2023 – present

- Flight Performance Analyst on NASA Dragonfly Mobility Team – performs Monte Carlo analyses, sensitivity studies, and flight envelope sweeps for rotorcraft on Titan
- Applies mission design, orbit estimation, and mission concept development to a variety of national security space missions/projects
- Co-PI of 2-year joint IRAD with UMD – leads team in using neural radiance fields to render high-fidelity multi-spectral dynamic spacecraft scenes
- Lead author of APL response to NASA Aerocapture Technology Demonstration Mission Request for Information

NASA, Visiting Technologist/Intern (multiple) — Remote / Pasadena, CA
Research collaboration with NASA Langley and NASA JPL; Summer 2019 intern at JPL — 2019-2022 (various)

- Co-developed novel guidance algorithm for drag-modulated aerocapture and implemented in C++ for use in DSENDS aerocapture simulation
- Performed flight-mechanics analysis and trajectory design for the Small High Impact Energy Landing Device (SHIELD) concept
- Designed aerocapture trajectories for Uranus orbiter "A Team" pre-decadal study

Altius Space Machines, Part-Time Aerospace Engineer — Broomfield, CO
Sept 2018 – Dec 2018

- Conducted NASA-funded study on commercialization of low-Earth orbit with partner Nanoracks
- Developed tool for rapid optimization of low-thrust trajectory design

Moon Express, Aerospace Engineering Intern — Cape Canaveral, FL
June 2018 – Aug 2018

- Designed, simulated, and analyzed trajectories for missions using GMAT, Trick, SPICE, and COSMOS tools
- Developed mission and spacecraft command sequences, incorporating designed maneuvers and vehicle constraints

- Updated and improved emulated flight software for the MX-1 vehicle

TU Delft Space Institute, Aerospace Engineering Intern — Delft, Netherlands
June 2017 – Aug 2017

- Designed interface between secondary lunar rover and spectropolarimetry instrument for Chandrayaan-2 ISRO mission
- Wrote system & subsystem requirements to constrain design of the instrument during conceptual design phase

Rapid Design of Systems Laboratory, Purdue University, Undergraduate Research Assistant — West Lafayette, IN
Aug 2016 – Dec 2016

- Researched potential application of FPGAs to rapid optimization techniques and created several example projects
- Demonstrated use of MyHDL to convert Python code to HDL in order to integrate FPGA development for the lab

Sandia National Laboratories, Aerospace Engineering Intern — Albuquerque, NM
June 2016 – Aug 2016

- Designed, conducted, and analyzed liquid droplet breakup experiments in the multi-phase shock tube
- Installed and configured geophysics software on Linux virtual machines to enable real-time seismic data analysis
- Assisted in setup and data collection for shock tube experiments

Honors and Awards

APL Director's Special Achievement Award 2025

IPPW Best Student Presentation Award 2022

John A. Vise Award 2022

NASA Space Technology Research Fellow 2019

Matthew Isakowitz Fellow 2018

Space & Satellites Professionals International Scholarship 2018

Warren G. Koerner Scholar 2016

Warren G. Koerner Scholar 2015

Stamps Scholar 2014

Journal Articles

Dimensionality Reduction for Onboard Modeling of Uncertain Atmospheres 2025
Samuel W. Albert, Alireza Doostan, Hanspeter Schaub
10.2514/1.A35839 (AIAA Journal of Spacecraft and Rockets)

Energy Reference Guidance for Drag-Modulated Aerocapture 2023
Samuel W. Albert, Ethan Burnett, Hanspeter Schaub, P. Daniel Burkhart, Alex Austin
10.1016/j.asr.2023.09.034 (Advances in Space Research)

Co-Delivery of a Martian Probe Network 2023
Samuel W. Albert, Hanspeter Schaub
10.2514/1.A35560 (AIAA Journal of Spacecraft and Rockets)

Relative Motion in the Velocity Frame for Atmospheric Entry Trajectories 2023
Samuel W. Albert, Hanspeter Schaub
10.2514/1.A35753 (AIAA Journal of Spacecraft and Rockets)

Flight Mechanics Feasibility Assessment for Co-Delivery of Direct-Entry Probe and Aerocapture Orbiter 2022

Samuel W. Albert, Hanspeter Schaub, Robert D. Braun
10.2514/1.A34953 (AIAA Journal of Spacecraft and Rockets)

Conference Papers

Onboard Density Modeling for Planetary Entry via Karhunen-Loève Expansion March 2023
Samuel W. Albert, Alireza Doostan, Hanspeter Schaub
10.1109/AERO55745.2023.10115794 (IEEE Aerospace Conference, Big Sky, MT)

Relative Motion on Highly-Eccentric Atmospheric Entry Trajectories January 2023
Samuel W. Albert, Hanspeter Schaub
hanspeterschaub.info/Papers/Albert2023.pdf (AAS/AIAA Space Flight Mechanics Meeting, Austin, TX)

Maneuver Design and Flight Control for a Martian Probe Network August 2022
Samuel W. Albert, Hanspeter Schaub
hanspeterschaub.info/Papers/Albert2022b.pdf (AAS/AIAA Astrodynamics Specialist Conference, Charlotte, NC)

A New Guidance Technique for Discrete-Event Drag Modulation for Aerocapture Missions February 2022
Ethan R. Burnett, Samuel W. Albert, Hanspeter Schaub
10.1007/978-3-031-51928-4_50 (AAS Guidance, Navigation, and Control Conference, Breckenridge, CO)

Co-Delivery of Multiple Small Probes to the Martian Surface January 2022
Samuel W. Albert, Hanspeter Schaub
10.2514/6.2022-1653 (AIAA SciTech, San Diego, CA)

Linear Covariance Analysis of Entry and Aerocapture Trajectories in an Uncertain Atmosphere January 2022
Jack Ridderhof, Samuel W. Albert, Panagiotis Tsiotras, Hanspeter Schaub
10.2514/6.2022-1216 (AIAA SciTech, San Diego, CA)

Finite-Dimensional Density Representation for Aerocapture Uncertainty Quantification January 2021
Samuel W. Albert, Alireza Doostan, Hanspeter Schaub
10.2514/6.2021-0932 (AIAA SciTech, Nashville, TN)

AeroDrop: Prospects and Challenges for Co-Delivery of Probe and Orbiter via Aerocapture August 2020
Samuel W. Albert, Robert D. Braun, Hanspeter Schaub
hanspeterschaub.info/Papers/Albert2020.pdf (AAS/AIAA Astrodynamics Specialist Conference, Lake Tahoe, CA)

Comparative Study of Lift- and Drag-Modulation Control Strategies for Aerocapture February 2020
Casey R. Heidrich, Evan Roelke, Samuel W. Albert, Robert D. Braun
AAS Guidance, Navigation, and Control Conference, Breckenridge, CO

Conceptual Development of AeroDrop: Aerocapture and Direct Entry for Two Spacecraft on a Common Approach Trajectory January 2020
Samuel W. Albert, Robert D. Braun
10.2514/6.2020-1737 (AIAA SciTech, Orlando, FL)

Aerodynamic Breakup and Secondary Drop Formation for a Liquid Metal Column in a Shock-Induced Cross-Flow January 2017
Yi Chen, Edward P. DeMauro, Justin L. Wagner, Marco Arienti, Daniel R. Guildenbecher, Paul Farias, Thomas W. Grasser, Patrick Sanderson, Samuel W. Albert, Aaron Turpin, William Sealy, Remington S. Ketchum
10.2514/6.2017-1892 (AIAA Aerospace Sciences, Grapevine, TX)

Measurements of the Initial Transient of a Dense Particle Curtain Following Shock Wave Impingement January 2017

Edward P. DeMauro, Justin L. Wagner, Lawrence J. DeChant, Steven J. Beresh, Paul Farias, Aaron Turpin, William Sealy, Samuel W. Albert, Patrick Sanderson
10.2514/6.2017-1466 (AIAA Aerospace Sciences, Grapevine, TX)

Other Papers/Presentations

Relative Motion About Aerocapture and Entry Trajectories August 2023
Samuel W. Albert, Hanspeter Schaub
International Planetary Probe Workshop, Marseille, France. Oral Presentation

(*Best Student Presentation Award*) Entry Flight Mechanics Analysis for SHIELD: Small High Impact Energy Landing Device August 2022
Samuel W. Albert, Hanspeter Schaub
hanspeterschaub.info/Papers/IPPW22_AlbertSchaub.pdf (International Planetary Probe Workshop, Silicon Valley, CA. Oral Presentation.)

Aerocapture Simulation in Basilisk, an Open-Source Astrodynamics Framework August 2022
Mikaela Felix, Samuel W. Albert, Hanspeter Schaub
hanspeterschaub.info/Papers/IPPW22_MikaelaFelix.pdf (International Planetary Probe Workshop, Silicon Valley, CA. Poster Presentation.)

Efficient Delivery of a Network of Small Probes to the Martian Surface March 2022
Samuel W. Albert, Hanspeter Schaub
hanspeterschaub.info/Papers/AlbertSchaub_poster_2022.pdf (Low-Cost Science Mission Concepts for Mars Exploration workshop, Pasadena, CA. Poster Presentation.)

Revolutionizing Access to the Mars Surface March 2022
Christopher J. Culbert, Bethany L. Ehlmann, Abigail A. Fraeman, Samuel W. Albert, Don Banfield, Jonathan Bapst, Dave Bearden, Kevin Bonnet, Joel Burdick, Wendy Calvin, Barbara Cohen, Tim Crain, Charles Edwards, Giusy Falcone, Elizabeth Frank, Andrew Horchler, Mark Johnson, Brett Kennedy, Laura Kerber, Rob Manning, David Masten, Larry Matthies, Michelle Munk, David Murrow, Paul Niles, Mark Panning, Zachary Putnam, Eva Scheller, Rachel Sheppard, Nathan Stein, Skylar Wei, Ryan Woolley, Paul Wooster
10.7907/d1sm-mj77 (Final Workshop Report for the W.M. Keck Institute for Space Studies)

Designing Probe and Orbiter for a Single Entry Trajectory September 2021
Samuel W. Albert, Hanspeter Schaub
10.7907/d1sm-mj77 (AIAA Rocky Mountain Annual Technical Symposium, Boulder, CO. Oral Presentation.)

Co-Delivery of Probe and Orbiter via Aerocapture for Interplanetary Missions July 2021
Samuel W. Albert, Robert D. Braun, Hanspeter Schaub
hanspeterschaub.info/Papers/Albert2021c.pdf (International Planetary Probe Workshop, Virtual. Oral Presentation.)

One Approach Trajectory, Multiple Vehicles March 2021
Samuel W. Albert, Robert D. Braun, Hanspeter Schaub
hanspeterschaub.info/Papers/Albert2021c.pdf (Revolutionizing Access to the Martian Surface Workshop, W. M. Keck Institute for Space Studies. Poster Presentation.)

Enabling and Enhancing Science Exploration Across the Solar System: Aerocapture Technology for SmallSat to Flagship Missions March 2021
Alex Austin et al.
https://doi.org/10.3847/25c2cfeb.4b23741d (White Paper for the Planetary Science Decadal Survey, 2023-2032)

Aerocapture as an Enhancing Option for Ice Giants Missions July 2020
Soumyo Dutta et al.
ntrs.nasa.gov/citations/20205002647 (White Paper for the Planetary Science Decadal Survey, 2023-2032)

AeroDrop: Dual Aerocapture-Entry Architecture for Multiple Spacecraft Missions July 2019
Samuel W. Albert, Robert D. Braun

International Planetary Probe Workshop, Oxford, UK. Poster Presentation

Survey of Microbial Environment for Crew Health at the Mars Desert Research Station April 2018
Samuel W. Albert, D. Marshall Porterfield
aiaa.org/awards/regional-student-paper-conferences (AIAA Region III Student Conference, West Lafayette, IN)

Professional Service and Involvement

International Planetary Probe Workshop (IPPW) 2023 – present
- 2026: Chair, Local Organizing Committee
- 2024: Chair, Technical Committee, Ice Giants & Gas Giants session
- 2023: Co-Chair, Technical Committee, Innovative Concepts for Exploration session
- 2023: Student Organizing Committee

Cislunar Security Conference 2024 – present
- 2025: Technical Committee
- 2024: Chair, Technical Committee, Oversight & Norms session

Undergraduate Research Program (x2) Aug 2021 – May 2022
Research Supervisor
- Developed and supervised research by two undergraduates in the Autonomous Vehicle Systems Laboratory
- Tutored students in spacecraft dynamics, spacecraft guidance, programming, and software development practices
- Students were selected for IPPW 2022 and National Conference on Undergraduate Research

Graduate School Peer Mentor (x6) Aug 2019 – May 2022
Mentored six first-year graduate students

Patti Grace Smith Fellowship Program (x3) Aug 2020 – Dec 2022
Reviewed applications, interviewed semifinalists, and mentored two recipients

Purdue Honors College Aug 2018 – May 2020
Peer mentor

Students for the Exploration and Development of Space (SEDS) Aug 2014 – May 2018
- 2017: Chair, Council of Chapters, SEDS USA
- 2016: SpaceVision 2016 organizing committee
- 2015: Purdue SEDS National Representative

Sigma Gamma Tau, Purdue Chapter Jan 2016 – May 2018
Inducted Member

Purdue Global Engineering Program Jan 2015 – May 2018
Program Ambassador

Purdue Student Publishing Foundation Jan 2016 – May 2018
Vice-Chair

Study Abroad and Additional Experience

NASA Micro-g NExT Competition Aug 2017 – Aug 2018
- Proposed, designed, and fabricated air leak repair device
- Planned and directed testing in the Neutral Buoyancy Laboratory at NASA Johnson Space Center

Mars Desert Research Station Crew 186 Apr 2017 – May 2018
- Health & Safety Officer at analog Mars base in Hanksville, UT, for two weeks
- Collaborated with NASA JSC to study microbiome in habitat using PCR and MinION DNA sequencer

Study Abroad at Universidad de Carlos III, Madrid, Spain Jan 2017 – June 2017
Exchange semester with full aerospace engineering coursework and Spanish language immersion

Study Abroad: US/European Perspective of Space Exploration May 2016

Study abroad Maymester including ESA HQ, ESA ESTEC, Airbus Space & Defence, and TU Delft

Engineering Projects in Community Service Jan 2015 – Apr 2016

Project Manager, team of 17 students, worked with local university & community in Lumbisi, Ecuador, to design and build covered outdoor seating

Study Abroad at Universidad de Cartagena, Colombia June 2015 – July 2015

Summer term including Spanish language intensive, Latin American history & culture, and internship with physics department

References

Ben Schmachtenberger: Section Supervisor, Space Algorithms and Technologies, Johns Hopkins University Applied Physics Lab, benjamin.schmachtenberger@jhuapl.edu

Dr. Hanspeter Schaub: Distinguished Professor, Aerospace Engineering Sciences, University of Colorado Boulder, hanspeter.schaub@colorado.edu

Dr. Dan Burkhart: Senior Staff Engineer, Entry Descent and Landing GN&C Group, NASA Jet Propulsion Laboratory, paul.d.burkhart@jpl.nasa.gov

Dr. Bobby Braun: Sector Head, Space Exploration Sector, Johns Hopkins University Applied Physics Lab, bobby.braun@jhuapl.edu

Dan Dumbacher: Chief Innovation and Strategy Officer, Special Aerospace Services, dan-dumbacher@purdue.edu