

Alex Utter

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- Objective** **Architect, develop, test, and troubleshoot bespoke embedded electronic solutions for spacecraft.**
As CEO and founder of Keppytronics LLC, I solve challenging digital design problems including digital signal processing, networking, sensor interfaces, real-time embedded control systems, time-transfer, and wireless communications. With a focus on avionics for spacecraft, I can develop and troubleshoot custom hardware, firmware, gateware, and software for reliable embedded systems, including mixed-signal analog and digital systems using FPGAs, microprocessors, and other electronic components.
- Education** **Stanford University, Stanford, CA**
Master of Science in Electrical Engineering, completed March 2007. **GPA 3.95**
Harvey Mudd College, Claremont, CA
Bachelor of Science in Engineering, completed May 2005. **GPA 3.85**
- Work Experience** **Keppytronics LLC, Hawthorne, CA**
• *CEO & Founder, 2026 - Present*

Digital Communications Implementation, The Aerospace Corporation, El Segundo, CA

- *Senior Engineering Specialist, 2018 to 2025; Engineering Specialist, 2013; Senior Member of Technical Staff, 2011; Member of Technical Staff, 2007; Intern, 2005.*
- **Principal investigator for the Handle 2.0 payload interface unit:**
The “Handle 2.0” payload interface unit is an extension of the “Slingshot” initiative (below), scaling the modular interface concept to accept larger payloads in LEO and GEO. As principal investigator for the Handle 2.0 project, I coordinated design, build, and testing performed by dozens of engineers across many disciplines. As software lead, I also developed the framework for CoAP-based CC&T and a test framework for software-in-the-loop simulation of the entire spacecraft and payload LAN.
- **Command and data-handling lead for the Slingshot-1 cubesat mission:**
The “Slingshot-1” cubesat mission, launched in July 2022, was a multi-year project showcasing the benefits of standardized modular interfaces in smallsats, realizing 75-90% reduction in spacecraft integration time. As the command and data-handling lead, I architected the modular payload LAN concept, developed flight software for the onboard Ethernet switch, coordinated command and telemetry processing for all 19 payloads, developed ground software infrastructure for day-to-day operations, and assisted in resolution of payload anomalies during all stages of the mission.
- **Project lead and principal developer for the SatCat5 open-source Ethernet switch:**
SatCat5 is an open-source project implementing an IEEE802.3-compliant layer-2 Ethernet switch, acting as a standalone system or a network-on-chip scaling from 1-100 Gbps aggregate throughput. The switch is the cornerstone of command and data-handling for both Handle and Slingshot, and has been enthusiastically adopted by new-start projects across the company and beyond. SatCat5 has been ported to several major FPGA platforms (Lattice, Microsemi, Xilinx), has resulted in multiple patents, and features best-in-class support for the IEEE1588 Precision Time Protocol, enabling time-distribution with sub-nanosecond accuracy. As the project lead, I personally developed more than 90% of gateware and software for this project (VHDL, C++, Python), working with additional hardware and software engineers as-needed. *See also:* <https://github.com/the-aerospace-corporation/satcat5>
- **Lead architect and gateware developer for the Aerospace cubesat camera system:**
Conceived in 2010 and first used on the AC7A/OCSD mission (launched Oct. 2015), iterations of this system have been used on more than a dozen spacecraft and are still in active development. The system uses a custom FPGA board to collect, process, and store video data from multiple visible or infrared cameras concurrently, and provides high-rate image filtering to improve sensitivity for navigational star-tracking cameras. As the lead architect for this system, I worked closely with stakeholders to establish system requirements, handled component selection for all major subsystems, worked closely with hardware engineers to complete PCB schematic and layout, and personally developed more than 75% of the system gateware and software (VHDL, C++), including algorithm development, flight software, test support, and integration of an optical communications downlink.
- **Lead engineer for multiple Aerospace cubesat systems, including:**
 - * Multipurpose DSP system with a 1 GHz ADC and an Artix-7 FPGA.
 - * Ground- and space-based modems for free-space optical communications
 - * Data-acquisition system for a linear-mode photon-counting sensor.
 - * Multipurpose AES-GCM encryption module for various FPGA platforms.
- **Helped diagnose two separate on-orbit anomalies in newly-launched GPS satellites.**
- **Assisted in backwards-compatibility verification for new GPS III waveforms.**

Skills

- Programming languages:
 - Expert: C/C++, VHDL
 - Proficient: Java, MATLAB, Python, Rust
 - Familiar: CUDA, Simulink, Tcl, Verilog
- Design, implementation, and verification of:
 - Digital systems based on FPGAs and microcontrollers.
 - Embedded software using “bare-metal” frameworks.
 - Multithreaded software on single- and multi-core CPU platforms.
 - Clock-crossing for synchronous, asynchronous, and plesiochronous systems.
- Analysis and implementation of digital signal processing on CPU, FPGA, and GPU platforms:
 - Time-transfer and ranging at sub-nanosecond scales
 - Modems for freespace optical communications
 - Multirate and polyphase fixed-point filters
 - Adaptive equalizers and linearizers
 - Carrier- and timing-tracking loops for optical and radio communications
 - Acquisition and tracking of direct sequence spread spectrum (DSSS) signals
 - Emulated impairments such as phase noise, amplifier saturation, and channel fading
- Review of printed circuit board (PCB) schematics and layout for high-speed digital signal integrity.

Selected Patents & Publications

- **Alexander Utter** and Joseph Zales. “*Precision Time Protocol at Picosecond Scale Over Asynchronous Ethernet.*” IEEE Aerospace Conference 2025.
- **Alexander Utter.** “*Beyond DDMTD – Sub-Picosecond Timestamps for Asynchronous Clocks.*” IEEE Access 2023. doi: 10.1109/ACCESS.2023.3345833.
- Hannah Weiher, Dan Mabry, and **Alexander Utter.** “*Slingshot: In-Space Modularity Test Platform.*” AIAAA SciTech 2022 Forum.
- **Alexander Utter**, Mark Zakrzewski, Andrew Keene, Samuel Dietrich, Sammy Lin, Eric McDonald, Nathan Whitehair, and Jason Zheng. “*SatCat5: A low-power, mixed-media Ethernet network for smallsats.*” AIAA/USU Smallsat Conference 2020.
- Eugene Grayver, **Alexander Utter.** “*Extreme Software Defined Radio—GHz in Real Time.*” IEEE Aerospace Conference 2020.
- David Allen, Alberto Arredondo, John Betz, Alessandro Cerruti, Benjamin Davidson, Karl Kovach, and **Alexander Utter.** “*Effect of GPS III weighted voting on P(Y) receiver processing performance.*” Journal of the Institute of Navigation 2020.
- Richard Welle, **Alexander Utter**, Todd Rose, Jerry Fuller, Kristin Gates, Benjamin Oakes, and Siegfried Janson. “*A CubeSat-Based Optical Communication Network for Low Earth Orbit.*” AIAA/USU Smallsat Conference 2017.
- Darren Rowen, **Alexander Utter**, Richard Dolphus, and Eddson Alcid. “*A Miniature, Low-Power Star Tracker for Precision Pointing Nanosatellites.*” AAS Guidance and Control Conference 2015.
- **Alexander Utter**, C. E. Edgar, T. D. Powell, and P. A. Dafesh. “*Cyclostationary Analysis of SVN-49 Signal Distortion.*” ION Technical Meeting 2011.
- **Alexander Utter**, Henry Chen, Shane Ouchi, David Money Harris, Amanda Rainer, Keane Kaneakua, Chris Prounh, and Samuel S. Osofsky. “*Adaptive two-channel automatic gain control system.*” IEEE Aerospace Conference 2006.
- **Patent US12107589B2** “*Vernier phase locked loop*”
- **Patent US12063068B2** “*Tracking system*”
- **Patent US11055254B2** “*Mixed media Ethernet switch*”
- **Patent US10996340B1** “*Tracking system*”
- **Patent US10340962B2** “*Amplitude domain circuits...for reducing an interference signal*”
- **Patent US9092371B2** “*Signal parameter estimator*”

Awards

Aerospace, Communications and Networking Division Team Achievement Award (June 2012):
“For developing new mission capabilities for a classified customer.”

Aerospace, Communications and Networking Division Spot award (August 2009):
“For responsive and in-depth analysis of GPS transmitter data in the assessment of root cause for the GPS SV49 payload anomaly.”

ACM International Collegiate Programming Contest, 2007 World Finals, on a three-person team representing Stanford University. Placed 26th out of 6,099 teams from 82 countries.

Other

Advent of Code 524 stars (2015 - 2025)
TS/SCI clearance (2012 – 2026)