# Mathew Merkow

**Flight Software Lead • Software Systems Architect • Chair, LASP AI Steering Committee**

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## SUMMARY

Flight software lead with twenty years in engineering, eighteen of them building spacecraft and embedded systems, and a team lead at LASP since 2014. All my NASA missions followed NPR 7150.2, and on each I worked directly with the mission scientists. I led flight software for CLARREO Pathfinder (CPRS) from inception through delivery, and supported it through on-orbit commissioning, which just finished successfully. On the Emirates Mission to the Asteroid Belt (EMA), I am the Flight Software Lead & Scrum Master for six avionics teams and 27 engineers, and coordinate our four subsystem leads. I have helped build two generic frameworks that turn mission-specific software into shared platforms: Adamant for flight software, used on CPRS and EMA, and OpenCT for command and telemetry, used across every EMA subsystem. I chair LASP's AI Steering Committee, which brought approved AI tools to our entire lab. I run its meetings, set its agenda and priorities, helped lead its security analysis, and wrote its training.

## EXPERIENCE

**Flight Software Lead, Software Systems, and OpenCT Architect, Emirates Mission to the Asteroid Belt (EMA)**

LASP, Boulder, CO — January 2023 to present

- **Leading through leads.** Lead the avionics flight software system through its four subsystem leads: coordinate tasking and priorities, build consensus or make the call, trace requirements, run the weekly delivery review, and present the full system at mission reviews
- Manage flight software schedule and development process, and provide the flight software and lab-needs budget inputs
- Helped organize the EMA avionics group, a new structure at LASP that brings the FPGA/CDH and flight software teams together and works closely with the EGSE and simulation teams. Designed its Scrum process with the new group and trained the FPGA and validation engineers in Scrum.
- **Development process.** Serve as Scrum Master for all avionics Scrum teams, covering 27 engineers in six teams: SBC, SSR/YMC, and GNC flight software, FPGA/CDH, OpenCT, and validation software. Run five parallel two-week sprint-planning series, backlog refinement, team scrums, and the avionics team meeting (scrum of scrums), aligning deliveries with hardware milestones.
- **Ground software.** Architect and lead developer of OpenCT, the mission's shared command and telemetry framework: helped create its architecture, began developing it in October 2025, and took over the project in December 2025
- **Flight software.** Wrote Guidance, Navigation, and Control (GNC) flight software until OpenCT took priority, and contribute to SBC flight software. For the Solid-State Recorder (SSR) flight software, set up the unit-test framework and CMake build.
- **Simulation.** Brought Renode emulation to EMA, helped create the SBC SoftSim, and was its main maintainer, making it usable for the SBC team
- **Hiring and staff development.** Served on hiring panels for engineers and student employees, including four current flight software team members, and write about ten peripheral performance evaluations a year (11 in 2026), and have mentored about eight students and junior engineers

**Flight Software Lead (2017 to 2023), then Flight Software Engineer, CPRS**

LASP, Boulder, CO — January 2017 to present

- Led flight software for a complex pointing system and hyperspectral imager on the International Space Station that measures reflected solar energy and calibrates instruments already in orbit
- **Team management.** Managed a team of three engineers and up to three rotating students, owned schedule, development process, status reporting, and the NASA relationship, and provided budget inputs, from kickoff through software delivery
- **Design and static analysis.** Owned system-wide flight software design and source code, worked hands-on on the gimbal pointing system (HPS), and ran static analysis on the HPS and Adamant flight software
- **Mission lifecycle.** After acceptance testing, which passed in one run, and the Software Acceptance Review, handed the lead to an engineer I had mentored, and supported integration and test and launch as needed. The software has needed no fixes since. Increased support for on-orbit commissioning, including trending and root-cause analysis of anomalies. Continue to support operations as needed.

**Chair, AI Steering Committee**

LASP, Boulder, CO — August 2025 to present

- **Responsible AI.** Chair LASP's cross-functional committee on adopting AI tools, covering engineering practice, technical evaluation, training, policy, security and compliance, infrastructure, and cost
- **Working with managers.** Worked closely with the IT director and the managers of the electrical engineering, FPGA, spacecraft, and other lab groups, brought their input into the committee's decisions, and made the calls that moved the team forward
- Helped lead the security and compliance analysis behind tool selection with LASP IT, including a vendor certification comparison and a NIST 800-171 review for export-controlled data
- Authored and presented technical and cost recommendations to LASP's Senior Leadership Team, which accepted them
- Designed and delivered AI training and onboarding: trained about 80 EMA engineers and helped train about 70 more across LASP

**Member, Information Technology Advisory Council (formerly the Information Technology Governance Committee)**
LASP, Boulder, CO — September 2022 to present

- Represented the Engineering division, and since the 2026 reorganization represent the Software department
- Reviewed lab IT plans, helped shape the committee charter, and helped run the 2023 IT listening tour

**Flight Software Lead, TSIS**
LASP, Boulder, CO — April 2014 to 2019

- **Full mission cycle.** Led a team of two engineers and designed & wrote software for the TIM, SIM, and TPS instruments, from requirements and architecture through test, deployment to the International Space Station, and science operations
- **Science data.** Built ground tools to analyze 1553 telemetry, report on commanding and telemetry on orbit, and validate TIM and SIM science data during integration and test; wrote and ran integration and test scripts
- **Sponsor relationship.** Owned the flight software relationship with NASA and worked with hardware and systems engineers across the mission lifecycle, and continue to support the mission as needed

**Flight Software, Electrical, and Systems Engineer**
LASP, Boulder, CO — January 2009 to April 2014

- Lead flight software engineer for the TIM and SIM instruments, and TCTE flight software lead and systems engineer, owning its flight software relationship with NASA
- Contributed digital electrical design on TSIS, TCTE, and CICERO
- **NASA NPR 7150.2.** Designed software to NPR 7150.2, ran CodeSonar and CodePeer static analysis, and took it through NASA design reviews with software quality assurance, implementation, hardware integration, testing, launch, and post-launch support

**Space Research Engineer**
United States Air Force Academy, Colorado Springs, CO — January 2008 to December 2008

- Led electrical and embedded software design for the WISPERS project: schematics, PCB layout, firmware, and test
- Mentored cadets on the Falcon Satellite program

**Computational Research Engineer**
Array BioPharma, Boulder, CO — May 2006 to September 2007

- Built machine-learning tools in Python and C++ that helped scientists filter screening results and find likely drug candidates, using decision-tree ensembles, neural networks, and self-organizing maps. Tested algorithms on a computing cluster and turned the useful ones into tools. Published the self-organizing map work as first author in 2007.

**Principal, Merkmatics Engineering**
Denver, CO — Founded September 2009

- Built and published the Merkmatics Chess Clock for iOS, handling design, software, graphics, pricing, release, and support

## SELECTED ACCOMPLISHMENTS

- **Adamant.** As flight software lead on CPRS, the project that created Adamant, co-designed and built LASP's open-source framework for safety-critical, model-driven embedded software with its lead developer, who reported to me. Reviewed all of its code. Adamant generates structure, documentation, and software and test scaffolding from system models, and developers write the behavior in Ada. Its component model lets a team rearchitect a system by editing a single assembly file. Helped prepare the Adamant presentations given at NASA workshops. github.com/lasp/adamant
- **OpenCT.** Holds command and telemetry definitions in one generic representation and deterministically generates the interfaces to our ground tools: command and control systems, the sequencer, spreadsheets, editable HTML, SQLite databases, and the TED table editor. A team writes their definitions once, and once they validate, every supported output is available. On EMA, it is used across every subsystem, with versioned releases, reproducible builds, and automated validation in continuous integration.
- **AI-assisted development ROI method.** Wrote a method for measuring the return on AI-assisted development. It counts the full cost, measures value against a comparison group, and reports the engineering time it frees as a low-to-high range.
- **Proposals.** Wrote the flight software sections, staffing plans, and cost estimates for Libera, StarX, Daphne, and TAUS ARCUS, and helped write the CPRS proposal.

## EDUCATION AND CERTIFICATION

- M.S., Electrical Engineering, control systems focus, University of Colorado Boulder; coursework in machine learning and scientific computing; research on controls for robotic systems and wind turbines under Lucy Pao and Todd Murphey
- B.S., Electrical and Computer Engineering, University of Colorado Boulder
- B.A., Physics, Colorado College
- Registered Scrum Master, Scrum Inc., certified through February 2025

## AWARDS, PUBLICATIONS, AND TEACHING

- Robert H. Goddard Exceptional Achievement Team Award, NASA, TSIS team, 2013
- M. Merkow and R. K. DeLisle, "Improving the Performance of Self-Organizing Maps via Growing Representations," Journal of Chemical Information and Modeling 47(5):1797-1807, 2007
- Teaching assistant, Control Systems Analysis, University of Colorado Boulder, 2006