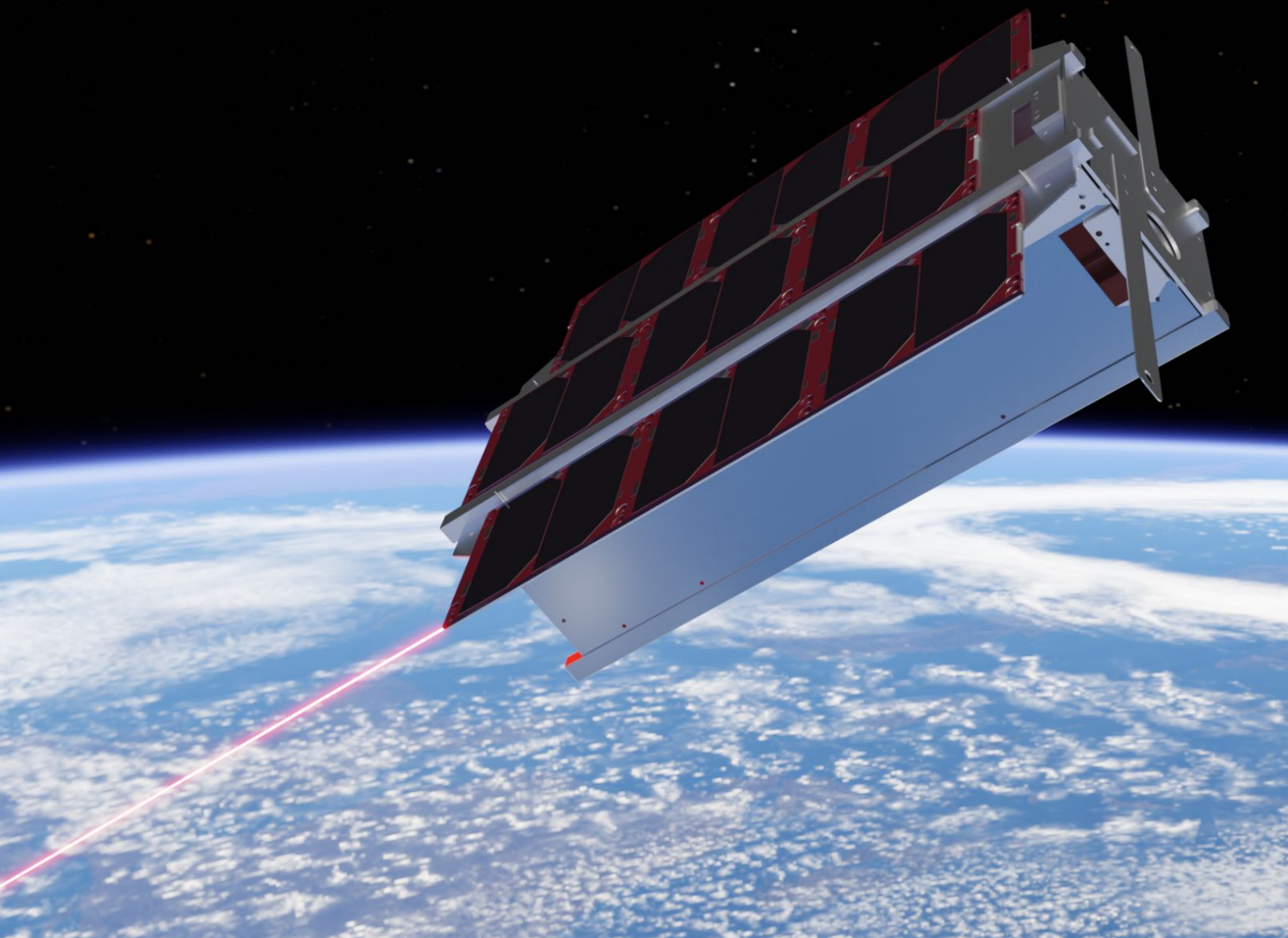
PULSE-A

2025 Q1 Progress Report



POINTS OF CONTACT

PULSE-A Management

Logan Hanssler	Project Lead	lhanssler@uchicago.edu
Seth Knights	Technical Lead	knightss@uchicago.edu
Eliana Schiller	Administrative Lead	eschiller@uchicago.edu
Graydon Schulze-Kalt	CubeSat Lab Manager	graydonsk@uchicago.edu
Ian Goldberg	Operations Manager	iangoldberg@uchicago.edu

Donations & Partnerships

Aishani Mohan	Funding Department Lead	aishanimohan@uchicago.edu

Media Inquiries

Sofia Cavallone	Outreach Department Lead	scavallone@uchicago.edu

UChicago Space Program Leadership

Lucas Glickman	Chapter President	lglickman@uchicago.edu
Graydon Schulze-Kalt	Chapter Vice President	graydonsk@uchicago.edu

Faculty Advisors

Dr. Tian Zhong	Principal Investigator	tzh@uchicago.edu
Dr. Michael Lembeck	Systems Engineering Mentor	mlembeck@illinois.edu
Dr. Makan Mohageg	Optical Engineering Mentor	makan.mohageg@boeing.com

PROJECT SPONSORS & PARTNERS

NASA

SELECT EQUITY

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF ASTRONOMY AND ASTROPHYSICS

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF PHYSICS

psd

THE UNIVERSITY OF CHICAGO
PRITZKER SCHOOL OF MOLECULAR ENGINEERING

Ansys

cadence

CHICAGO QUANTUM EXCHANGE

ILLINOIS

SEDS USA

Swabian instruments

genesis

OpenProject

THE UNIVERSITY OF CHICAGO
CENTER FOR LEADERSHIP AND INVOLVEMENT

TABLE OF CONTENTS

PROJECT MISSION

PULSE-A is the first satellite to be designed entirely by undergraduate students at the University of Chicago. The 3U CubeSat's primary mission objective is to demonstrate space-to-ground circular polarization-modulated optical communications at a data rate of 10-25 Mbps. PULSE-A's secondary objective is to act as a risk reduction mission for the future quantum key distribution demonstrator, PULSE-Q. PULSE-A's payload, optical ground station, and pointing, acquisition, and tracking sequence will be repurposed in PULSE-Q following minimal modifications.

If you are interested in receiving a 1-page overview of the PULSE-A mission, please contact Logan Hanssler or Seth Knights.

2024 Q4 RECAP

- October 3rd – 5th: Attended and presented at SEDS-USA's SpaceVision 2024 conference.
- October 5th: Taught the local community about PULSE-A at the South Side Science Festival.
- October 19th: Ended successful recruiting cycle, onboarding 24 new team members!
- October 25th: Hosted a telescope observation night with Ryerson Astronomical Society.
- October – November: Finalized PULSE-A's preliminary design and documentation.
- November 23rd: Held our successful Preliminary Design Review!
- Late November – December: Began incorporating design review feedback and planning for the Detailed Design Phase.

I. PROJECT UPDATES

Structures & Manufacturing Department discussing a team member's mini-project results. Left to right: Eliana Schiller, Leon Gold, Allegra Hamacher, Michael Bolgov, Alexandra Yao, Zane Ebel.
Credit: Robert Pitu

Following the team's successful Preliminary Design Review, we turned back to PULSE-A's core mission of being an educational project across engineering disciplines. In an effort to continue building undergraduate learning and ensure the whole team has the requisite knowledge to fully grasp the mission's systems, we divided the team into small groups of 2-4 students working on individual mini-projects. From creating a microscope or designing a lens mount to defining, building, and testing a custom weather sensor, our ~15 groups completed a variety of educational mini-projects. Our goal was to bring members together across focuses, giving people exposure to areas of engineering that they may not be exposed to by simply working on tasks within their departments. We especially wanted to give more educational exposure to members who were recruited shortly before the Preliminary Design Review, as they could now focus on making sure they have a solid understanding of the team's goals.

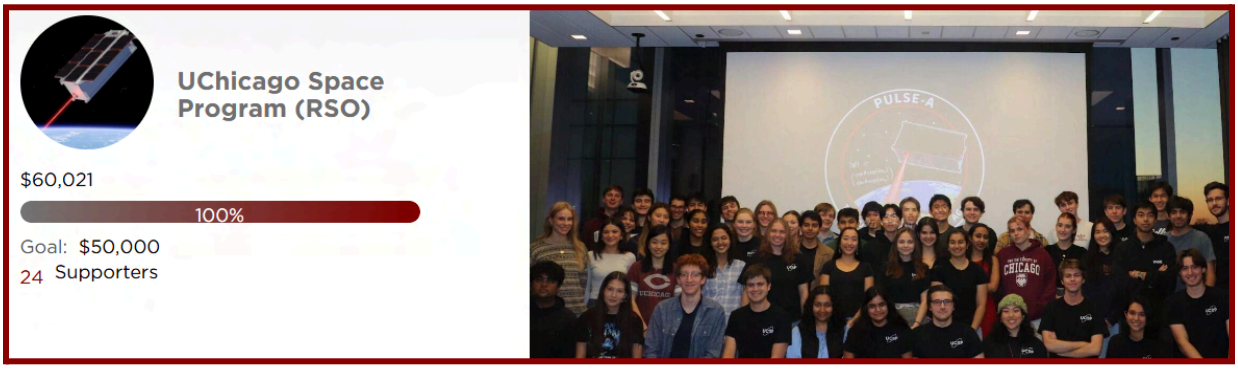
The team has also been working hard to incorporate feedback from our Preliminary Design Review, which has involved a redesign of some assemblies. As such, we have revised a number of our budgets and are continuing in our iterative design process. We are building new board prototypes, testing and improving custom lens mounts, optimizing component placements following optical analyses, and much more. We're also continuing to develop our plans for PULSE-A's Assembly, Integration, and Test Phase. All of the team's development this quarter, both educationally and technically, is in preparation for our next major milestone: the Critical Design Review, which has now officially been scheduled for November 22nd, 2025!

For a more detailed account of our technical progress in Q1 2025, please refer to Section V: Engineering Updates.

II. FUNDING UPDATES

A. GIVING DAY

On March 25th and 26th, UCSP participated in the University of Chicago's Giving Day Campaign. As a result of the campaign, we have raised over $60,000 toward developing PULSE-A! Furthermore, the team received an additional $10,000 gift from a generous private donor shortly after Giving Day's conclusion. Once available to us, we will release the names of our incredible supporters who made this Giving Day possible. This has been our most successful fundraising effort since PULSE-A's acceptance by NASA's CubeSat Launch Initiative. In addition to NASA's pledge of up to $300,000 in launch vehicle integration costs, the team has now secured a total of just over $150,000 in funding for development and component procurement. Our participation in Giving Day is a monumental success and cements the mission's future, ensuring funding challenges will not form a bottleneck in our development process.



Above: UCSP's donation page on the University of Chicago Giving Day site

B. WOMEN'S BOARD GRANT

On January 13th, the PULSE-A Team submitted a letter of intent to apply for the University of Chicago Women's Board's annual grant. We requested to apply for $30,000, which would fully close the development and procurement budget for the mission's bus and RF ground station. On March 14th, we were informed of our letter of intent's acceptance! We are now working to develop a full proposal for the Women's Board Grant by the April 18th deadline, and we excitedly await a response from the Women's Board in late Q2.

III. UPCOMING PUBLICATIONS

During this past quarter, the PULSE-A Team submitted 4 abstracts to the 2025 Small Satellite Conference. We are excited to announce that all 4 abstracts were accepted! As a result, on August 13th, 2 members of PULSE-A leadership will take to the conference's main stage for a 15-minute talk on our mission and its educational impacts. The payload, bus, and ground station will be presented as posters, and all 4 presentations will be accompanied by a research paper in the conference proceedings. This is a significant achievement for the PULSE-A team, as this marks the project's first-ever publications and most impactful presentations to date.

Additionally, we submitted 7 abstracts to the University of Chicago's 2025 Undergraduate Research Symposium, which will be held on April 25th. All of our abstracts were accepted for presentations, and 19 team members will get the opportunity to discuss their work with the University of Chicago community! We'll be delivering an oral presentation on the mission, and PULSE-A's payload, bus, optical ground station, RF ground station, systems engineering, and optical simulation results will each be presented as posters. With the symposium held well in advance of SmallSat 2025, it will serve as useful practice to ensure our papers and conference presentations are as high quality as possible.

We're excited to share more details and outcomes of these opportunities in our next update!

Upper left image credit: https://smallsat.org/

IV. OUTREACH UPDATES

A. SPACE SETTLEMENT DESIGN COMPETITION

Over the course of Q1, the PULSE-A Team hosted a Space Settlement Design Competition (SSDC) at Bennett Day School (BDS) in downtown Chicago! SSDCs are typically day-long, intensive aerospace industry simulation events for high school students. Students are sorted into teams structured like companies in the engineering industry and given a request for proposal (RFP) modeled after calls issued by NASA. Each team then designs a space settlement according to the RFP's specifications and presents it to a judging panel who selects a winning team.

In an effort to innovate the SSDC format, we partnered with two teachers at BDS to run a longer format SSDC in the students' curriculum. BDS is a small school with a class size of 15-20 students, and their curriculum is entirely project-based. For 7 weeks, all of the school's 11th and 12th grade students worked together every school day to design a space settlement. The students were sorted into 2 teams with roughly equal skill sets and demographics, and they excitedly competed in the unprecedented SSDC.

We held a kick-off event for the SSDC on January 27th where students learned about the competition's structure, were introduced to the RFP and methods to approach the design process, and formed team structures. Following the kick-off, Logan Hanssler (PULSE-A's Project Lead) checked in with the students weekly to answer their questions and help them in the design process. On February 14th, Logan, Juan Prieto (PULSE-A's Ground Station Lead), and several other volunteers gave feedback to the teams in a Red Team Review. This allowed the students to practice presenting, receive comprehensive feedback on their designs and proposals, and learn about how design reviews are structured in the aerospace industry. The SSDC culminated at the school's Demo Night on March 12th, where each team presented their final proposal to their teachers, parents, and a panel of judges from the PULSE-A Team and Industry Simulation Education. At the Demo Night's conclusion, the winning team was announced to thunderous applause! We also announced the 6 students who were selected to move on to the International Finals for Space Settlement Design at Kennedy Space Center this summer, making them the first students selected for the SSDC Finals from a Chicago-based competition.

Above: One of the space settlements designed by Bennett Day School students in the UCSP-run SSDC.
Credit: Bennett Day School's Terra2Luna Team

Left: The winning team presenting with the team president (Anna Quada) presenting. *Credit: Julia Hodges*
Right: Students of both teams celebrating after Regional Coordinator and PULSE-A Project Lead Logan Hanssler (at podium) announced the winners. *Credit: Julia Hodges*

The BDS SSDC was a major success for UCSP's outreach initiatives. As a long-term event requiring consistent support from our members over several months, this has been our most ambitious outreach initiative yet! To capitalize on this success, we are already planning for an SSDC in the more traditional weekend event format to be held at UChicago in 2026. We hope to bring in students from across the Chicago area to compete in our next event, and we will especially focus on schools in the South Side area. We plan for SSDCs to become consistent annual events hosted by UCSP, and we look forward to sharing updates on SSDC-related events in the future!

B. WHPK RADIO FEATURE

On March 3rd, PULSE-A was featured on WHPK 88.5 FM, a community, non-profit, student-run radio station dedicated to broadcasting diverse, unique content across the UChicago and larger Chicago South Side community. Technical Lead Seth Knights and CubeSat Lab Manager Graydon Schulze-Kalt discussed PULSE-A's mission and impact in an interview with the radio show host, establishing student-run aerospace engineering initiatives' place within the show's celebration of community excellence and building.

Image credit: WHPK "Who's On?" show logo. https://whpk.org/

C. SPEAKER SERIES

UCSP has launched its new Aero/Astro Engineering Industry Speaker Series! Dr. Michael Lembeck, PULSE-A's Systems Engineering Mentor, gave the series' first lecture on February 4th. After joining our mission in 2024, Dr. Lembeck has acted as an invaluable advisor for PULSE-A's Systems Department, Avionics Department, and team-wide engineering development. As a speaker, his talk "Tiny Giants: The Satellite Story, from Sputnik to CubeSats" provided exciting educational and professional insight into the history, development, and industry processes of space engineering, extending aerospace appreciation to a broad audience composed of both PULSE-A Team members and others from the UChicago community.

Left: Dr. Michael Lembeck presenting the history of CubeSats. *Credit: Eliana Schiller*
Right: A team photo after Dr. Lembeck's talk. *Credit: Monica Gould*

Our second speaker of the series was Aaron Pickard, an MBA candidate at UChicago's Booth School of Business, Student Advisor for the PULSE-A Team, and former Lead Systems Test Engineer. On February 26th, Aaron shared his experiences in aerospace engineering and business through his talk "Great Mistakes Investing in Space," thus introducing listeners to an interesting interprofessional facet of the aerospace industry.

Left: Aaron Pickard presenting to the PULSE-A team and other UChicago community members.
Credit: Eliana Schiller

Both speakers garnered a successful turnout, and we are currently in the process of developing further installments in the series!

D. UPCOMING OUTREACH PLANS

After successfully following through on our goal to coordinate at least one new community event per month, PULSE-A's Outreach Department aims to extend the promotion of space sciences, aerospace engineering, and STEM education across UChicago and the broader Chicago area further through multiple upcoming initiatives.

We will continue inviting guest speakers from a variety of technical backgrounds to share their experiences and expertise, broadening both PULSE-A's internal education and UChicago's external engagement with space sciences that range across industries. To further amplify our community outreach and educational influence, we are also in the process of developing a PULSE-A YouTube channel that will feature technical engineering tutorials, mission member interviews, PULSE-A lab tours, and other relevant videos that showcase various facets of our project, establishing an online, wide-reaching presence.

Finally, in the coming weeks, we will be compiling a PULSE-A yearbook. The yearbook will highlight all team members across engineering and administrative divisions, project developments, pictures, and more, serving as a creative, comprehensive demonstration of our mission's collaborative and technical milestones.

V. ENGINEERING UPDATES

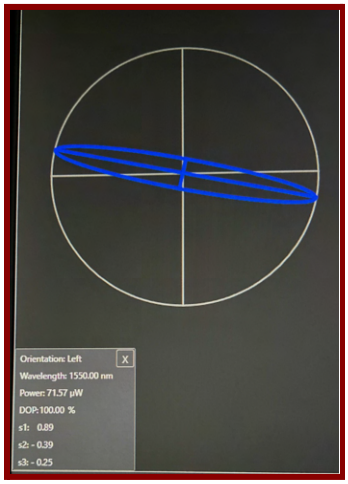
A. OPTICAL PAYLOAD

Over the past quarter, the Optical Payload Department has focused on finalizing design details that were incomplete or raised as issues during the Preliminary Design Review. Some examples include: determining whether our collimator requires a vent hole, optimizing the diameter of the fast steering mirror, and finding viable components (in size and speed) for modulating between orthogonal polarizations. Additionally, we moved more fully into the testing and simulation phase, performing fiber alignment experiments on the bench and investigating the range of our detection and fine pointing abilities in Zemax.

The largest change to the optical payload over the course of this quarter has been the decision to scrap the use of a polarization switch or phase modulator to encode our data. Having spent months looking at various models and speaking to manufacturers, we concluded that there was no available option that fit our speed, size, and cost constraints. As such, we have chosen instead to directly modulate two polarized lasers, and then join their signals together using a 2x1 fiber combiner. This

requires a more involved approach to fiber alignment and pulse timings, but this mitigates the need for a modulator component.
We have also further investigated the degree of radiation hardening required for our electronic components, which has a large bearing on our budgeting. We have concluded that extensive radiation hardening is not required for the majority of components, such as our fast steering mirror and EDFA, based on the expected rates of radiation and our short mission lifetime. The FPGA is the only component that will require significant shielding.

On the laboratory testing front, we have collected data from our fiber experiment. This data confirms our hypothesis that light becomes elliptical as we introduce increasing misalignment relative to the axis of the optical fiber. The results help define the maximum allowable misalignment in the payload before the ground station can no longer detect the transmitted bits reliably.



Optical laboratory results showing polarization state at fiber output
Credit: Sofia Mansilla

Lastly, we have been characterizing our pointing and detection abilities in Zemax OpticStudio by exposing the system model to ground beacon light at various angles of incidence. This allows us to determine the limits of what can be detected on the quadrant photodiode and how effectively the fast steering mirror can correct for misalignment. Additionally, we have been working on simulating back-reflections throughout the payload to design a baffling system.

In the coming weeks, we anticipate purchasing, wiring, and testing many more of our selected components, including the quadrant photodiode and EDFA, with the goal of being prepared to assemble a complete test system during summer 2025.

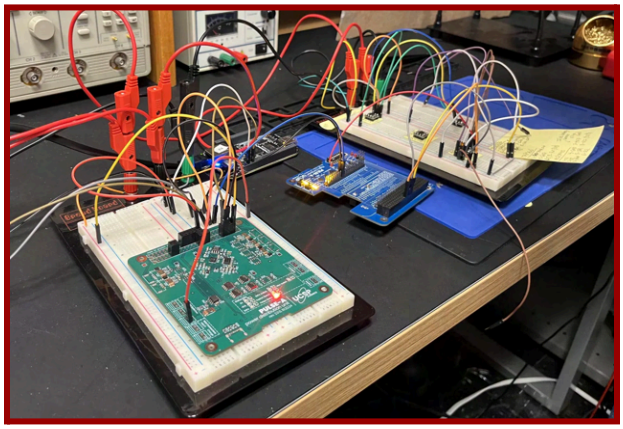
B. AVIONICS HARDWARE

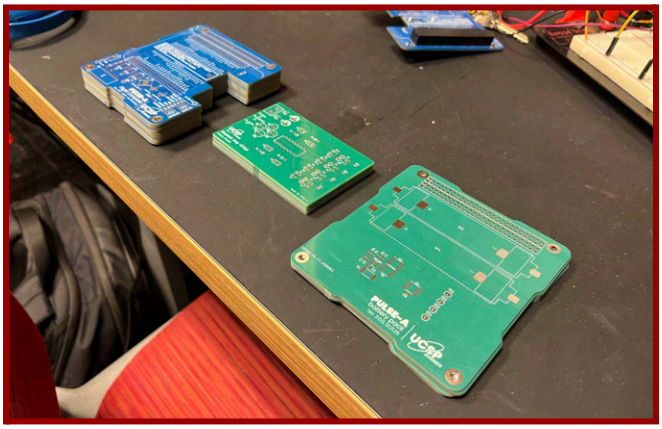
The Avionics and Flight Software team was divided into two independent groups, with one focused on hardware and one on software. This will allow us to speed up and focus development as we move toward our Critical Design Review.

The Avionics Hardware Department recruited two new engineers in Q1 who are working on the Power subsystem. After assembling the previously designed battery board, the new members began the design of the next revision of the pack with more advanced functionality, including better battery management, charge protection, and thermal control circuitry. The third revision of the power distribution unit is also nearing completion and represents a significant evolution over

version two. The on-board computer advanced through several iterations, with each board undergoing rigorous lab testing to verify its components. The design has reached a stable revision, with each successive board representing small tweaks and bug fixes. Another group of the Avionics Department is working on processing circuitry for the payload's quadrant photodiode. After breadboarding, the team has moved towards PCBs and plans on integrating with Payload lab testing shortly.

Lastly, the Avionics Hardware Department is working toward preliminary integration testing before the quarter's end, which will mark a large milestone in hardware development!





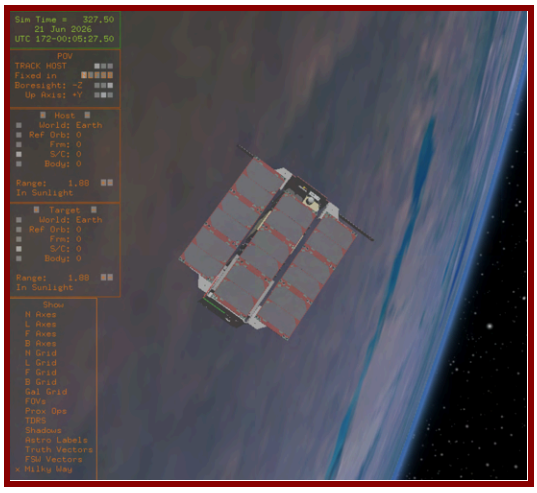
Left: Testing a recent revision of the power distribution unit. *Credit: Graydon Schulze-Kalt*
Right: Recent revisions of the on-board computer, quadrant photodiode processing circuitry, and battery board (left to right). *Credit: Ian Goldberg*

C. FLIGHT SOFTWARE

In Q1 2025, the Flight Software Department has focused on learning the tools we will be using to build the final version of the flight software. The team participated in a training session with the NASA Goddard team to learn more about how to properly construct flight software with the NASA core Flight System (NASA cFS), the framework we have chosen to use for this project. We have also kept in touch with several contacts at NASA and have been utilizing the Basecamp project (built by a retired Goddard NASA cFS engineer) to learn the proper practices to build apps in NASA cFS. Additionally, members of the team have been working on their own NASA cFS apps to gain experience in the system, and we will soon embark on a group project to build a mockup of the flight software to practice before moving on to developing the final software.

As a part of learning how to work in the NASA cFS system, the Flight Software Leads attended the first annual NASA cFS Symposium at the NASA Goddard Space Center in Washington, D.C. At the conference, they learned about upcoming improvements to the NASA cFS system and open-source tools being developed by other research groups that will soon enable easier development in the NASA cFS framework. The trip allowed the team to form stronger relationships with the NASA Goddard team and other universities and research groups actively working in NASA cFS. This has opened a number of doors to the team for potential future collaborations!

Above: Flight Software Leads Catherine Todd and Spencer Shelton at NASA cFS Symposium.
Credit: NASA Goddard Space Flight Center https://etd.gsfc.nasa.gov/?attachment_id=21281



Above: NASA 42 simulator configured with PULSE-A CubeSat and NASA cFS.
Credit: Brian Yu

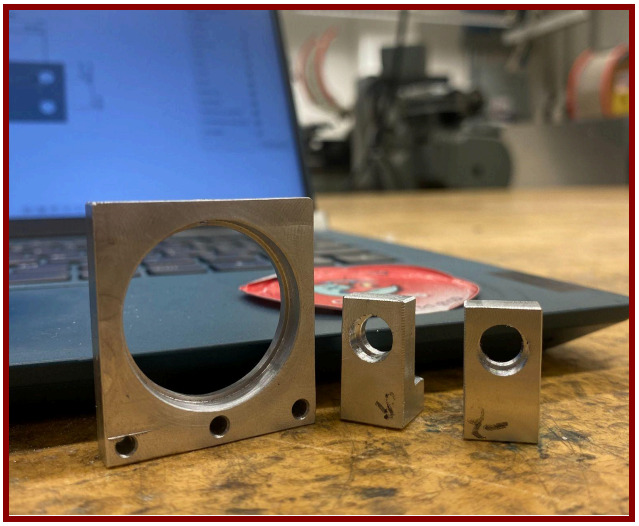
In order to support testing our NASA cFS environment, the team has been working on a simulator utilizing 42 (an open-source simulator created by the NASA Goddard Space Center) connected to a computer running our NASA cFS flight software. As we write the flight software, this simulation capability will allow us to do both rapid testing on in-development builds and extended stress testing on prototypes of the flight hardware to ensure reliability. We are also looking to expand this simulator in the future by integrating optics, allowing us to simulate the science mission and verify the architecture we have proposed.

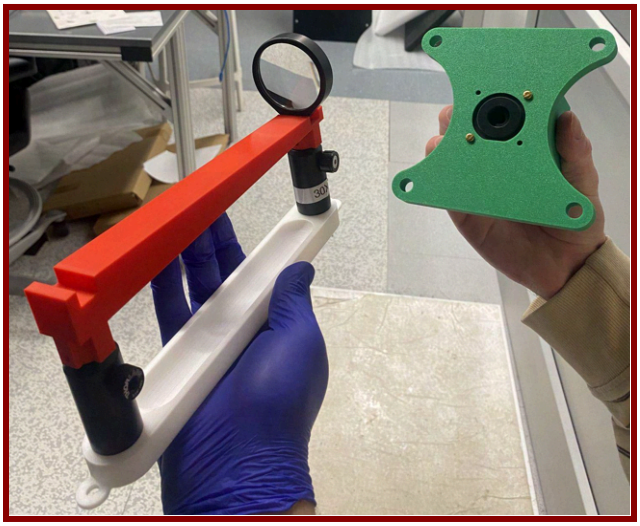
To properly enable all of the on-orbit operations required of the flight software, the Flight Software Department has been working in close conjunction with the Avionics Hardware Department on the on-board computer. We are working to ensure that proper support for timing and reliability is built into the board designs to allow us to create redundant systems with the timing accuracy needed to complete the science mission.

Looking forward, we will be working to further improve our simulators and refine the proposed software architecture, with a particular focus on the pointing, acquisition, and tracking (PAT) sequence of the science mission.

D. STRUCTURES & MANUFACTURING

For the start of Q1 2025, the Structures & Manufacturing Department onboarded a few new members to bolster on-campus manufacturing efforts and to incorporate more systems engineers into the department. The main focus during Q1 was skill development for members, through individual projects and accompanying presentations. We had engineers learn new CAD skills, get machine shop trained, manufacture optical mounts, and more!





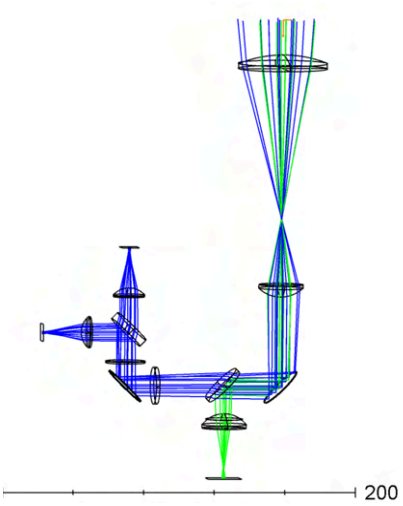
Left: Optical mounts designed and machined by the department. *Credit: Robert Pitu*
Right: 3D printed custom beam expander and mounting hardware. *Credit: Robert Pitu, Seth Knights*

Considerable efforts were taken to consolidate design decisions for the structural elements of the satellite, such as the optical payload box and deployable systems, and to create a more thorough design validation scheme. Through input from our mentors and collaborators, such as Gran Systems and UChicago's ETSG, we settled on a robust verification round for design modifications, which now requires at least two department members to look over and check all of the dimensions modeled by the designer, using an engineering drawing of the design.

E. OPTICAL GROUND STATION

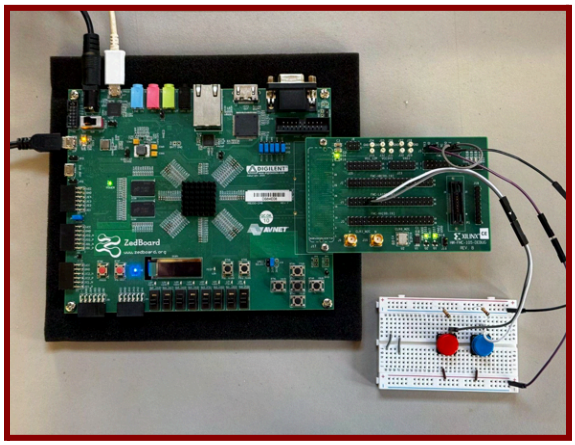
In Q1 2025, the Ground Station Department was split into the Optical Ground Station and RF Communications Departments to support a more specialized detailed design process for each new department. The Optical Ground Station Department focused its efforts on verifying the feasibility of our optical communications terminal. Development was focused on verifying our link budget calculations, determining our capability of performing a successful PAT sequence, and producing the required components to have a functioning communications terminal. These aims guided our development throughout the quarter.

We began developing a polarization-based link budget, which would allow us to determine how our polarization states change between the payload and the ground station. To produce such a link budget, we updated our optical simulations in Zemax OpticStudio to show the corresponding polarization effects introduced by our optical system. We further began testing certain parts of our system with the Payload Department to examine effects on polarization. This included experiments on how polarization-maintaining (PM) fibers and the ground station's telescope introduce ellipticity to the polarization states. Throughout the Q2, we will continue to examine components' effects on polarization states and attempt to model the effects of the atmosphere over long distances on circular polarization.



Above: Optical ground station Zemax OpticStudio simulation.
Credit: Elizabeth Rosario

This past quarter, we worked out the communication protocol for the optical ground station's FPGA, marking a massive achievement for the department! We then continued developing the optical ground station's electronics based on an improved understanding of how to communicate with the FPGA. We've also begun implementing an error correction scheme based on Reed-Solomon codes. We will simulate this error correction scheme and expected optical communication errors in the coming quarters, thus allowing us to implement fitting error corrections in our FPGA.

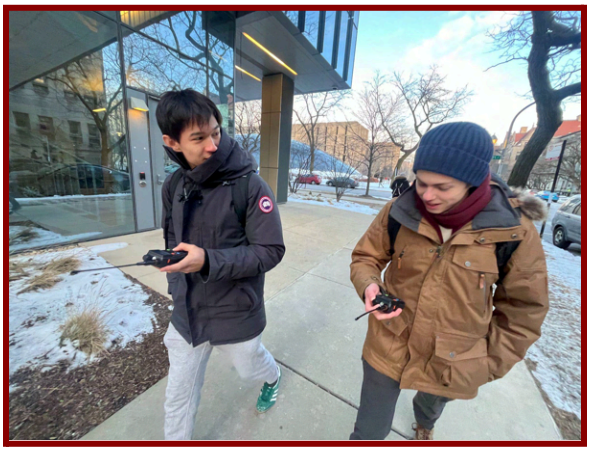


Above: Optical ground station FPGA setup for input and output.
Credit: Leah Vashevko

Finally, we finished developing software that allows our telescope to slew along a set path, and we have been improving the code to reduce the difference between the intended path and the telescope's actual position. We have also integrated a tracking camera into our telescope setup. In order to point the telescope and acquire images through the camera simultaneously, we have begun developing our ground control system using OpenC3 software. This will enable us to integrate all of our software for ground operations, including both the optical ground station and RF ground station. Once fully integrated, this will allow us to track the ISS with our telescope, thus verifying our ability to perform the optical ground station's component of the PAT sequence and track a moving satellite in LEO.

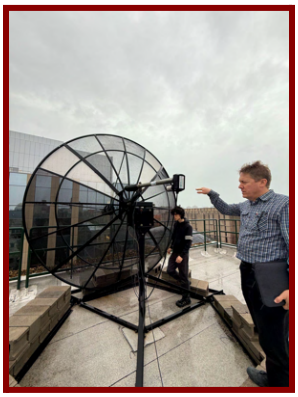
F. RF COMMUNICATIONS

In Q1 2025, the RF communications team finalized the component choices for the RF ground station (RFGS): we decided on an amateur radio transceiver and SDR rather than a hardware radio. Following a broad search, we have also finalized the choice for the satellite radio module as the Murgas UHF transceiver, which has flight heritage and previous success at the best price point. Additionally, we have decided to operate at half-duplex over full-duplex, which will support PULSE-A's necessary data rate at a reduced form factor and cost. We determined that we will use AX.25 and KISS protocols in our operations, and we trimmed our telemetry budget to better fit our mission's GPS requirements while retaining necessary satellite health information.



Above: RF Communications Lead Mason McCormack and Technical Lead Seth Knights (left, right) using BAOFENG handheld radios.
Credit: Graydon Schulze-Kalt

We confirmed the University of Chicago campus as the location for our RFGS after using an RTL-SDR to find that noise was sufficiently low at the 430-435 MHz range, which we will operate in. We are meeting and discussing with building safety and facilities to determine the final location of our RFGS and have received tentative approval to build and operate on campus. Purchasing components and assembly will begin as soon as possible. We will also begin filing our IARU frequency request once a location has been determined.



Left: RF Communications Department members testing new hardware. *Credit: Mason McCormack*
Right: Kersten Physics Teaching Center's Small Radio *Telescope. Credit: Mason McCormack*

Additionally, we have begun amateur radio experiments using BAOFENG handheld radios, testing repeater, radio net, and general voice transmission. This established a baseline for more complicated radio packet testing and radio protocol testing. Separately, we are repairing the Small Radio Telescope on the roof of the Kersten Teaching Physics Center and a YAESU FT-736R transceiver to gain experience working with sensitive receivers housed outdoors and complex electronics maintenance.

G. SYSTEMS ENGINEERING & INTEGRATION

Following the Preliminary Design Review, we implemented feedback from reviewers to overhaul our assembly, integration, and testing plans. In particular, we significantly overhauled our risk assessment framework to better align with NASA's risk assessment methodology, enabling us to prioritize mitigating the most impactful risks. We also streamlined our environmental and safety testing plans, allowing us to save time and money while still minimizing the risk of failure. Finally, we continued revising our system requirements, implementing a plan to measure, assess and record verification of all requirements.

In order to better understand the key requirements and risks driving design and to better prepare for PULSE-A's upcoming assembly, integration, and test phase, all members of the Systems Engineering and Integration Department have temporarily been reassigned to other departments. The goal is for systems engineers to gain more hands-on experience working with each subsystem, thereby greatly increasing their technical knowledge and facilitating a more accurate understanding of the PULSE-A Team's development. In Q2, the Systems Engineering and Integration Department will reconsolidate but continue to work more closely with other departments and participate more directly in hands-on design.

VI. Q2 OUTLOOK

With the completion of our independent projects, the team is hoping to move beyond foundational development and into a stage of focused execution. Q2 presents an important opportunity for us to make progress on the physical systems powering PULSE-A, as our design review this coming fall plans to test our reasoning and readiness on all fronts. All of our engineering departments hope to execute on proving the viability of critical system components – whether that be the control of our ground station, the satellite optics, radio frequency communications, or software engineering and design. While it won't be necessary to have built a final version for that review, we need to have shown that our design is feasible and that we know our component choices can result in a working product, even if revisions from testing must still be incorporated. With this in mind, each of our departments is converging on a strong set of hardware milestones for the following two quarters, many of which are laid out above. Our success in raising over $70,000 this quarter puts us well ahead of our expected fundraising goals and will give us some much-needed breathing room to purchase products with long lead times, along with those necessary for successful prototyping. We believe wholeheartedly that we are in the best position yet to ensure our mission succeeds!

— The PULSE-A Team

Read More:
www.uchicagospaceprogram.org