Preprint: SSC26-P2-33

Herding CubeCats: Challenges and Lessons Learned from a Student-Led CubeSat Organization

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ABSTRACT

CubeCats is a student engineering organization at the University of Cincinnati whose mission is to provide hands-on experience in space systems engineering through the design, development, and operation of nanosatellites. CubeCats is managed and run by students, with faculty serving primarily in an advisory role. The organization is entirely volunteer-based, with no direct integration into coursework or on-campus research laboratories. Although this approach provides a unique degree of independence as well as leadership and project management opportunities for students, it also presents challenges distinct from those encountered in professionally led satellite development, particularly in funding, member retention, and knowledge transfer. This work details the organizational challenges encountered during the eight-year development cycle of CubeCats' first CubeSat mission, the Low Earth Orbit Platform for Aerospace Research Development Satellite 1 (LEOPARDSat-1). The mission successfully launched to the International Space Station (ISS) in early 2026 aboard the Commercial Resupply Services (CRS) NG-24 mission and is currently awaiting deployment into low Earth orbit. While the lessons learned from these challenges have been used to inform the future direction of CubeCats as an organization, they are also expected to be broadly applicable to those seeking to establish or sustain similar student-led CubeSat programs at other institutions.

INTRODUCTION

CubeCats is a student-led technical engineering organization founded in 2015 at the University of Cincinnati (UC) with the mission of providing its members with hands-on, educational experience in space systems engineering, primarily through the design, development, testing, launch, and operation of flight-worthy aerospace systems.[1] In particular, the organization's primary focus is CubeSats, including the development of test devices to validate these flight systems and the ground station elements required to operate them. However, to onboard new first- or second-year members, CubeCats uses a year-long High-Altitude Balloon (HAB) project to teach foundational concepts in systems engineering, project leadership, technical communication, and various technical skills as part of the CubeCats Applied Training in Systems Engineering (CATiSE) program, before these students transition to more advanced satellite projects.[2]

CubeCats' operating model differs significantly from many university-based satellite programs. CubeCats is entirely managed and run by students, the majority of whom are undergraduates; UC faculty and staff serve primarily in an advisory role and do not directly handle the day-to-day operations of the organization. The organization is also entirely volunteer-based, with no direct integration into coursework or on-campus research laboratories, although collaboration with faculty, university offices, industry partners, and external organizations occurs when possible. Additionally, UC uses a Co-Operative education (Co-Op) model for most engineering degree paths, requiring undergraduate students to perform five semester-long internships to graduate. This creates a recurring cycle in which experienced members may be away from campus for an academic term, return with additional professional experience, and then graduate shortly after, significantly affecting scheduling, leadership, and membership experience levels.

These characteristics create an unusual yet instructive environment for small satellite development. CubeCats must perform many of the functions of a small aerospace enterprise while being staffed almost entirely by student volunteers. In addition to spacecraft engineering, the organization must manage recruitment, training, member retention, fundraising, accounting, sponsor relations, outreach, public communication, university relations, regulatory awareness, legal compliance, documentation, and long-term project continuity. These activities, while seemingly not immediately relevant to the core mission of CubeCats, are an essential part of the mission infrastructure required to keep technical work moving across academic schedules, leadership transitions, funding cycles, and varying levels of student availability. Student-led satellite teams succeed when they deliberately build the non-engineering infrastructure needed to sustain engineering work.

The Low Earth Orbit Platform for Aerospace Research and Development Satellite-1, or LEOPARDSat-1, is CubeCats' first space mission, the first space mission performed by UC students or faculty, and the first student-led satellite from the state of Ohio. LEOPARDSat-1 launched on April 11th, 2026, from Cape Canaveral Space Force Station aboard the CRS NG-24 mission and is scheduled for deployment into orbit from the International Space Station (ISS) in the summer of 2026.[3] While technical aspects of the mission will be discussed in future work, this paper serves to detail the long road to completing LEOPARDSat-1 through many challenges, focusing on the organizational, programmatic, and educational challenges encountered during its approximately eight-year development cycle.

The central lesson from LEOPARDSat-1 is that the limiting factors for student-led CubeSat programs are often organizational or institutional as much as technical. Funding continuity, leadership turnover, knowledge transfer, institutional alignment and backing, student accountability, external partnerships, and sustained engagement can determine whether a technically feasible mission survives through to launch. CubeCats' experience suggests that student-led satellite organizations must intentionally design their organizational systems to accommodate and mitigate risks presented by these unique situations, addressing organizational challenges with the same seriousness that they apply to spacecraft systems. By examining the challenges encountered during the development of LEOPARDSat-1, as well as other concurrent missions including HAB and outreach programs, this paper aims to document the lessons learned from these challenges for both future CubeCats ventures and other groups seeking to learn from them. Although these lessons are broadly applicable, they are particularly focused on providing a case study for other student organizations, university programs, and small satellite teams seeking to establish, sustain, or develop long-duration, student-led aerospace projects.

LEOPARDSAT-1

LEOPARDSat-1, as CubeCats' first satellite mission, serves as an educational platform alongside its main orbital technology demonstration experiment, testing radiation shielding materials. Although the payload is technically modest, LEOPARDSat-1 presents many of the same systems engineering, integration, testing, documentation, regulatory, and operational challenges encountered in larger aerospace programs. For CubeCats, this made the mission an effective case study in the organizational realities of student-led satellite development and serves as the organizational case through which CubeCats' challenges and lessons learned are examined.

The technical motivation for LEOPARDSat-1 is based on the need for improved radiation shielding materials for future space missions, especially long-duration crewed missions to the Moon and Mars. Carbon nanomaterials (particularly carbon nanotubes, fullerenes, and nanofibers) containing absorbed hydrogen have been identified as an attractive material for radiation shielding on future deep-space missions. This is due to the combination of hydrogen's excellent radiation shielding properties from its low Z-number with the carbon nanomaterials' high strength, useful thermal and electrical properties, and relatively good neutron absorption.[4,5] As ground-based radiation testing is not able to simulate the entire space radiation environment, LEOPARDSat-1 was conceived as a mission to test the radiation shielding properties of such a material in orbit using an inexpensive CubeSat.

However, carbon nanomaterials are, in general, expensive and difficult to acquire. Carbon fiber reinforced polymer, or Carbon-Carbon (C-C), combined with High-Density Polyethylene (HDPE), presents a viable analog that can mimic the shielding properties of carbon nanomaterials at a much lower cost. LEOPARDSat-1 therefore seeks to demonstrate a lower-cost orbital testbed for evaluating a carbon-based hydrogen hybrid shielding approach, serving as preparation for testing carbon nanomaterials on a future mission with a more mature design.

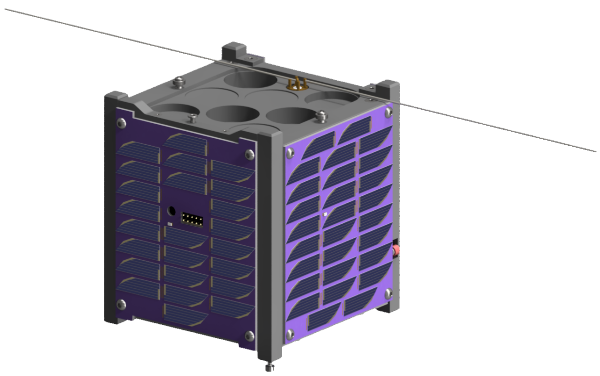

Figure 1: CAD model of the LEOPARDSat-1 CubeSat in its deployed configuration

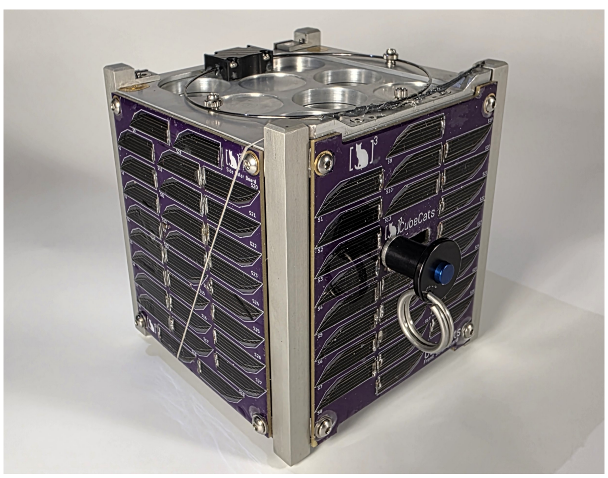

Figure 2: Final LEOPARDSat-1 flight CubeSat, just before integration into the NRCSD

Operationally, the LEOPARDSat-1 flight system consists of a single 1U CubeSat, as shown in Figures 1 and 2. The spacecraft is designed to collect radiation dose data in Low Earth Orbit (LEO) at regular intervals over a mission duration of at least four months. As Nanoracks (now Voyager Technologies) was selected as the LEOPARDSat-1 mission integrator, deployment will occur using the Nanoracks CubeSat Deployer (NRCSD) from the ISS. This results in an ISS-like mission orbit of approximately 400 - 420 km in altitude at an inclination of 51.6 degrees. This orbit exposes the spacecraft to portions of the LEO radiation environment, especially the South Atlantic Anomaly. It also provides regular passes over the Cincinnati region for downlink operations to ground stations operated by CubeCats in partnership with the UC Amateur Radio Club and the Cincinnati Astronomical Society.

Table 1 outlines the basic parameters of LEOPARDSat-1. The payload of LEOPARDSat-1 is centered around eight Varadis VT01 sensors. Each VT01 sensor contains two radiation-sensitive field effect transistors that measure accumulated radiation doses via their threshold voltages. Disk-shaped C-C/HDPE payload samples are held above these sensors to block incoming radiation from roughly half the sky. Each payload sample consists of a “sandwich” of C-C and HDPE for ease of manufacturing, with the sizes of each material adjusted to achieve a 6% hydrogen mass fraction; this mimics the projected mass fraction of hydrogen-storing carbon nanomaterials.[4,5] Three of the VT01 sensors are covered by a 6.5 mm thick “full-size” sample, two are covered by a 3.25 mm thick “half-size” sample, while the remaining three are not covered by a composite sample and act as controls. All of these samples are in-turn covered by a 1 mm layer of aluminum to simulate the outer skin of a spacecraft hull. The samples are positioned asymmetrically to reduce placement-dependent bias, helping ensure that differences in measured dose are attributable primarily to the shielding materials rather than variations in spacecraft bus shielding, sensor geometry, or off-axis radiation paths not passing through the samples.

Table 1: Design features and specifications of the LEOPARDSat-1 CubeSat

Feature	Specification
Mass	0.960 kg
Dimensions	10.35 x 34.99 x 11.96 cm (Fully Deployed)
Attitude Control	Passive Magnetic
Power Generation	136x GaAs Cells (4s32p) arranged in 5 panels
Power Storage	6900 mAh battery, consisting of 2x Li-Ion cells (2s1p)
Communication	Half-Duplex over UHF (436.98 MHz) with Dipole Antenna
Main Computer	ST STM32L152RE
Data Storage	1x 8 GB microSD card

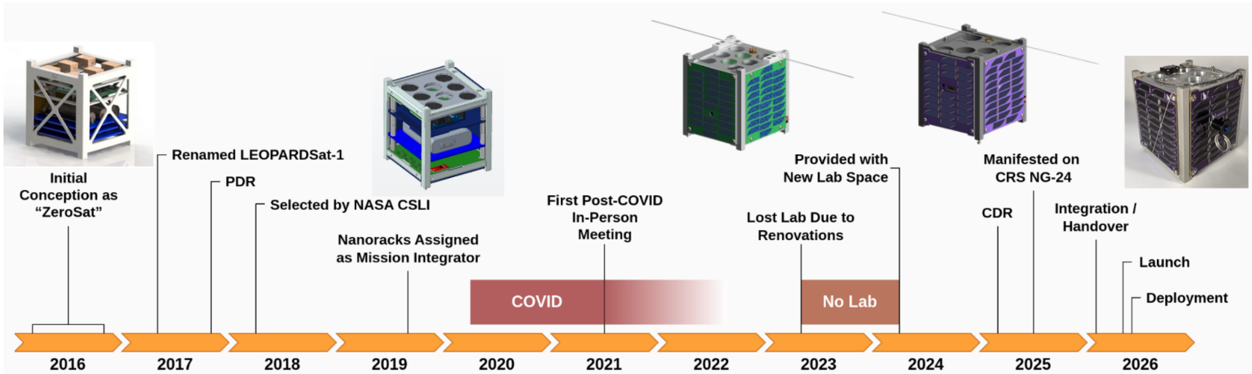

Figure 3: Overall timeline of the LEOPARDSat-1 project

CHALLENGES

Figure 3 shows the overall timeline of the LEOPARDSat-1 project, including major events, milestones, and the progression of the satellite design. The project originated as "ZeroSat" in 2016, an early concept selected for further development from several other student proposals. After a preliminary design review in November 2017, an application to the CubeSat Launch Initiative (CSLI) was submitted, which was selected by NASA on March 2, 2018. In August 2019, NASA assigned Nanoracks to be the mission integrator with a projected launch date in mid-2021.

Two external events occurred that significantly delayed the project past this initial estimate. Most prominent was the COVID-19 pandemic; the shutdown of all campus activities at UC brought the project to a near-complete halt for the greater part of 2020 and over half of 2021, with in-person meetings not resuming until June of that year. Secondly, due to extensive renovations on UC's campus, the organization had no dedicated lab space to work in from mid-2023 to mid-2024. Both of these events slowed progress, reduced student enthusiasm for the project, and limited new recruitment. Normal organizational activity did not fully recover to pre-pandemic levels until late 2024.

The following sections detail the specific organizational challenges CubeCats encountered over the course of the project, particularly those from which institutional lessons can be gleaned.

Recruitment & Retention

Recruitment is critical for the survival of a volunteer student organization and is largely centered on increasing "brand recognition" among the student body. Several different recruitment methods were attempted over the history of CubeCats. Based on how each student joined the organization's primary communication channel, Table 2 tracks the recruitment effectiveness of several methods over three academic years. Surprisingly, preliminary results indicate that mass poster and sticker placement around campus was the most successful option, roughly 15 times more effective than social media. Other methods presented mixed results.

Table 2: Recruitment results by source, 2023–2026

Recruitment Method	Relative Effectiveness	Number of Students
Campus Posters & Stickers	Highest Engagement (∼15x baseline)	379 Students
Word of Mouth	Baseline Engagement	Not Tracked
Social Media	Baseline Engagement	31 Students
In-Class Announcements	Baseline Engagement	26 Students

In the organization's experience, most students were enthusiastic in principle about taking part in a spacecraft mission, especially in later years, as it became apparent that the organization would actually complete a flight spacecraft. However, even after recruitment efforts that included massive flyer postings, many students remained unaware that CubeCats existed, including those who were actively interested in the field. Even those aware of the organization often showed a lack of clarity about its purpose and work. Interestingly, while the CubeCats logo (a silhouette of a cat within brackets to the cubic power) is highly popular among the student body, it occasionally led to initial perceptions that CubeCats is a math- or animal-focused student club, which inadvertently turned some prospective members away.

Member retention was and remains a significant challenge. Aside from common unavoidable reasons, several recurring themes emerged for why students dropped out of the organization over the course of the project:

- During slow periods in the project, particularly when no in-person meetings were taking place or no dedicated space was available, the lack of visible progress made it appear that the organization was inactive. This perception was reinforced by the actual shutdown of many other student organizations during the pandemic.
- Even when actual design and analysis progress was being made, the lack of visible products of this work (e.g., prototype hardware or functional software) created a student perception that little was being accomplished or that the work lacked hands-on value.
- Many tasks were assigned to newer students without extensive experience by more senior members, which occasionally led to a feeling of a lack of ownership over the work. In such cases, it was easy for a student to leave before finishing a task due to a lack of personal investment. This was especially true for tasks not deemed as interesting, such as writing test plans or compiling documentation.
- In the final years of LEOPARDSat-1 development, it became difficult to assign new members critical technical tasks, as the time required to bring a student up to speed competed with quickly approaching delivery deadlines. This led to newer students typically being assigned "mundane" tasks instead of front-and-center design work.
- Students also occasionally suffered from being overwhelmed by the technical details of assigned tasks. This remained true even for those who took part in the introductory CATiSE program, due to the steep jump in complexity between HAB missions and satellite systems.
- The organization also had to address the risk of silent disengagement, informally referred to as "ghosting" in which members stop attending meetings or responding to communications while still nominally responsible for assigned work.

A notable positive from both the perspective of recruitment and retention was the utilization of senior design, or capstone, projects. At UC, several engineering disciplines (especially electrical, mechanical, and computer engineering) allow seniors to select their own capstone project, including projects proposed by external organizations. Because students must complete a realistic engineering project to graduate, there is typically a reduced risk of students dropping out, and at least a minimally viable engineering work product is reliably completed by the end of the academic year. Senior students are also typically more experienced in their respective disciplines than underclassmen, though many still require an introduction to the basics of space systems engineering. One caveat of this approach, however, is that senior design projects must be completed within a strict two-semester time-frame (roughly eight months), meaning the project scope must be carefully managed to prevent overwhelming the senior team.

Continuity

Over the course of CubeCats' existence, there have been three near-complete turnovers in the organization's student leadership, defined loosely as almost all executive and project leadership members graduating at roughly the same time. The first occurred in mid-2019, when all of the founding leadership of the organization graduated. The second occurred from 2020 to 2022, when recruitment shortfalls due to COVID led to nearly all second-generation leaders graduating without replacements. Finally, as of mid-2026, the organization is going through a third round of turnover just after the LEOPARDSat-1 flight model was completed and handed off. Part of the reason for this regular turnover is that executive board and project management members tend to be upperclassmen (juniors or seniors) who only have a narrow window of being in their positions (1 - 2 years) before graduating.

Such leadership turnover is survivable, but a major issue experienced by UC CubeCats is a lack of a firm transition process for most positions or documentation of operational and regulatory aspects of the organization. Traditionally, the transitional period has been handled in an ad hoc manner by an upcoming student, who shadows the position they are going to take. This presents difficulty in official process documentation, especially when a student is on Co-Op (see below) during the time they would normally be shadowing. In general, it is hard to get students to write documentation, as it is considered a "boring" side task when almost all students join the organization to perform actual design, engineering, and testing work. Guidelines on how to document work have also changed repeatedly with new leadership, leading to inconsistent quality and quantity from year to year. Finally, when time pressure creeps in, tasks not directly needed to meet a deadline or complete a project, like documentation, are typically the first thing to be abbreviated or skipped. As a result, the majority of documentation exists in items that largely document themselves, such as design files (raw code, CAD files, etc.), manufacturing guides, or testing procedures.

What is largely missing is the decision-making, history, and rationales behind the project, much of which was lost during leadership changes and membership turnover.

University Interaction

One of the most critical aspects of the student organization is its relationship with the university and its constituent colleges, as they provide the institutional framework for laboratory space, funding administration, and external engagement. Officially, CubeCats has operated as a university-wide student organization rather than being housed under a single academic department or college. However, because its primary faculty advisors have always been members of the Department of Aerospace Engineering and Engineering Mechanics (AEEM), the organization's primary academic anchoring and day-to-day administrative touchpoints have naturally aligned with that department. Because CubeCats operates as a hybrid between a traditional student interest club and a technical research laboratory, navigating this unique organizational identity within a large university structure has required continuous coordination with respect to identifying the optimal channels for managing project funds and securing dedicated facility space.

The lean, flat organizational structure of CubeCats, comprising a small executive team, a single project manager, and specialized subsystem teams, naturally differs from the extensive, multi-layered governance required to manage a major research university. Consequently, administrative tasks involving external certifications and institutional approvals often required longer timelines than initially anticipated by the student team, requiring active coordination across multiple departmental offices. Furthermore, widespread campus construction and renovation projects significantly restricted available laboratory space during the critical final years of the LEOPARDSat-1 project. Because university space allocation prioritizes faculty-led research labs, core academic classrooms, and departmental offices, CubeCats experienced a temporary displacement from a dedicated physical space between mid-2023 and mid-2024. To resolve this critical issue, the faculty advisor worked extensively with the AEEM department leadership and university administration to secure a new permanent home for the organization. Part of the success of this effort was due to the specific administrative requirements of the NASA CSLI agreement, including the necessity of a secure, dedicated workspace for handling potentially ITAR-controlled satellite hardware, ultimately allowing the program to acquire its new laboratory facility.

Funding

Securing consistent financial support for a long-duration satellite project presents a unique challenge for an autonomous student organization. Because CubeCats was established as a university-wide organization rather than a departmental program, its initial financial foundation relied heavily on its faculty advisors. Leveraging their departmental affiliation, these advisors secured essential start-up funding from the College of Engineering and Applied Sciences (CEAS) and the Department of AEEM. These institutional resources, combined with external project grants acquired in collaboration with the advisors from the Ohio Space Grant Consortium (OSGC), were managed through the advisors' corresponding departmental accounts. This setup successfully funded the initial prototyping and procurement phases necessary to launch the LEOPARDSat-1 project. However, as is typical with fixed institutional allocations, these foundational funds were fully utilized by 2023 as the project transitioned into deep hardware construction and environmental testing.

Following the conclusion of this initial funding cycle, the organization transitioned to a more diversified, multi-source funding model, managed more directly by the student leadership. Rather than relying on a centralized funding stream, CubeCats integrated university student organization grants with smaller, independent donations. This model introduced operational challenges, as funding availability often followed cyclical student government budget rounds, resulting in fluctuating purchasing schedules. To maintain momentum during critical integration phases, student members occasionally made out-of-pocket purchases with the expectation of subsequent reimbursement. While this approach allowed technical progress to continue, it underscored the inherent difficulties of sustaining complex aerospace engineering timelines under a decentralized and variable funding structure.

As LEOPARDSat-1 construction neared completion and membership stabilized, CubeCats shifted toward a strategic, sponsorship-driven financial model. By cultivating direct relationships with external corporate and engineering organizations, the program has established a more resilient and sustainable financial framework. These industry partnerships extend beyond direct monetary contributions to provide student members with access to proprietary supplies, specialized testing facilities, and valuable professional networks. This structure serves as a mutually beneficial pipeline: corporate sponsors invest in a proven pathway of technically skilled engineering graduates, while CubeCats secures the reliable resources necessary to maintain a continuous, high-fidelity satellite development program.

Scheduling

As previously mentioned, the initial flight system completion date for LEOPARDSat-1 was intended to be mid-2021, although this date quickly became impossible due to COVID-19. Once work started again in 2021, the projected handover date was adjusted to late 2024, based on the then-current student engagement and an assessment of remaining work. However, over the course of the intervening years, this date slipped until the actual handover of the satellite in January 2026.

Some of the issues leading to this slippage have already been touched upon in earlier sections, including funding difficulties, low recruitment for several years, and unavoidable student distractions (exams, classwork, etc.). A unique element that affected the schedule was UC's degree progression calendar as shown in Figure 4. During Co-Op terms, most undergraduates must work a full-time engineering internship, temporarily decreasing the availability of students for almost 1/3 of their time at UC. Many Co-Ops also occur outside of the greater Cincinnati area, largely preventing these students from taking part in the organization for at least a full semester. Summer also tends to be a period of low activity each year, as students are either not in classes or are on Co-Op, other than those in their second year.

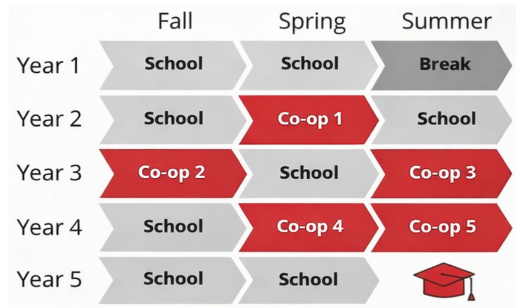

Figure 4: UC Co-Op and class timeline for undergraduate students (credit: UC)

Creating an accurate schedule is always difficult for aerospace projects, including CubeSat projects, but it is especially difficult for an inexperienced group doing such a project for the first time that cannot enforce deadlines as readily as a professional project.[6] For the LEOPARDSat-1 project, CubeCats used an online Gantt chart-based schedule, organized based on broad subsystem tasks (e.g., "redesign antenna deployment system"). It was found that this was not nearly granular enough, making tasks seem daunting and monolithic, which further made it impossible to accurately gauge time to completion, while also tying short and simple sub-tasks to more complex sub-tasks. Towards the end of the project, the Gantt chart started to be ignored except as a general list of tasks to complete.

LESSONS LEARNED

From these challenges, several major lessons were learned, which are currently being applied to future CubeCats projects and day-to-day operations. Many of these are cross-cutting in that they address multiple of the aforementioned challenges.

Maintain Engagement: Student members need to be engaged with exciting and meaningful work throughout all parts of the project, but especially between the initial period of excitement for a new project and the actual building and testing of the flight system. Ideally, there should be some sort of physical product members can point to as an accomplishment or to tinker with, even if just a basic hardware or software prototype.

Streamline Documentation Processes: The process of documentation, especially recording design rationales, project history, and testing procedures, needs to be streamlined as much as possible, both to maintain student interest and to capture all of this important information. CubeCats is currently investigating how newer LLM AI systems, with proper oversight, can be leveraged to speed up documentation without increasing the burden on student members.

Divide Work into Smaller Tasks: During project planning, the overall project should be divided into much smaller and shorter tasks than was done for LEOPARDSat-1. Smaller tasks facilitate scheduling because their timelines are easier to estimate, appear less intimidating to inexperienced students, and ensure that members who participate for only a short period of time can still accomplish a significant milestone. A better understanding of how to do this is based heavily on previous experience that needs to be captured.

Operate in Sync with Academic Calendar: As CubeCats cannot modify the overall UC academic calendar, it instead needs to operate around it. Tasks assigned to student members should be sized so that they are completable in one semester or less; this ties into the previously stated need for smaller tasking. Additionally, summer should be recognized as a relatively slow term and should be used for "catch-up" work and planning for the fall. Project schedules need to account for this, even if it requires more time to complete the project overall.

Position Redundancy: Certain roles within the organization, especially project management and executive positions, may need to be filled by multiple members who take on the position on alternating schedules, particularly to cover for a member who is on Co-Op. CubeCats has already done this for the leadership of the CATiSE onboarding program to cover both the fall and spring semesters.

Identify and Prepare Future Leadership Early: Students who commit to the organization and show promise for leadership need to be identified earlier and be prepared for these roles while older members are around to provide orientation.

More Transparent Operations: Although some decisions need to be made by only the executive and/or project management teams, the general membership needs to be aware to some extent of what is going on behind the scenes, so certain decision-making and rationales are not lost when these positions turn over.

Maintain Understanding with Institution: The organization needs to carefully ensure that it and the university are "on the same page" to prevent misunderstandings, especially with respect to lab space ownership, funding, and other policies, even as these change. This is especially true for how CubeCats fit in the larger structure of the university.

Maintain Diverse Funding Sources: Although all are important to an extent, relying too heavily on any one grant, contribution, or sponsor is risky because each of those sources can easily change or disappear over time. To be more resilient, the organization needs to combine university funding, external grants, corporate sponsorships, alumni support, individual donations, and crowd-funded initiatives to establish a resilient financial baseline.

Actively Seek Sponsorships and Donors: Although typically requiring a bit more persuasion than other sources of funding, recurring sponsorships provide a relatively stable form of funding with further benefits with respect to resources, support, outreach, and member career growth. Sponsors can also potentially be recruited from companies or institutions at which members are on Co-Op. Individual donors typically give less money, but can be an important source of used equipment and cost-covering funds. Maintaining these relationships is vital for the ability to take on larger, more complex projects.

Utilize Educational Nature of Organization: Due to CubeCats' small budget, the organization cannot afford to maintain certain kinds of expensive equipment or directly pay for certain services not covered under the CSLI contract. Instead, CubeCats was able to borrow equipment from supportive faculty or receive services for free or at a lower cost in exchange for mutually agreed-upon outreach opportunities.

CONCLUSION

LEOPARDSat-1 represents a major milestone for CubeCats and the University of Cincinnati, marking the culmination of approximately eight years of student-led development. The mission has demonstrated that a volunteer student organization can carry a spacecraft from early concept through to launch and has made clear that technical success depends heavily on organizational strength. Recruitment, retention, documentation, funding, university coordination, external partnerships, and leadership continuity all proved to be mission-critical functions.

The central lesson is that student-led programs like CubeCats must engineer the organization and non-technical elements as deliberately and intensely as they engineer the spacecraft. Elements such as volunteer accountability, knowledge transfer, institutional alignment, outreach, and sponsorship development are the infrastructure that allows technical work to continue across student turnover, academic schedules, and limited resources. These lessons are now informing the future of CubeCats, including the development of the Harmful Algal Bloom Satellite-1 (HABSat-1), the organization's next CubeSat mission focused on monitoring harmful algal blooms.[7] This 3U Earth-imaging satellite is far more complex, with a scope and budget over an order of magnitude beyond LEOPARDSat-1. This increased complexity makes the organizational lessons learned especially relevant. Applying these lessons will help CubeCats and other organizations transition from completing a first CubeSat mission to sustaining a repeatable, exceptional student-led satellite program.

Acknowledgments

Direct funding and resources for LEOPARDSat-1 were provided by the College of Engineering and Applied Sciences (CEAS), the Department of Aerospace Engineering and Engineering Mechanics (AEEM), and the University Funding Board (UFB) at the University of Cincinnati (UC), as well as the Ohio Space Grant Consortium (OSGC). The LEOPARDSat-1 launch was supported by NASA's Educational Launch of Nanosatellites (ELaNa) program, with integration assistance from Nanoracks/Voyager Technologies. Although far too numerous to list individually, the authors would like to acknowledge the students, faculty, and staff members who contributed to LEOPARDSat-1 over the years. Special thanks are also extended to external sponsors, individual donors, and various community members who generously assisted with their time, expertise, or equipment to make this mission possible, especially L3Harris Technologies, the 1819 Innovation Hub, the Cincinnati Astronomical Society (CAS), and the Cincinnati State Mechanical Engineering Technology (MET) machine shop.

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