ISBN: 978-628-96613-3-0. ISSN: 2414-6390. Digital Object Identifier: https://dx.doi.org/10.18687/LACCEI2026.1.1.1531

A Socio-Technical Access and Inventory Control System for an Emerging National Satellite Program: The Proyecto Morazán Case Study

David Alberto Pavon Bonilla [1]; Fernando José Zorto Aguilera [2]
[1,2]UNAH, Honduras, *dpavon@unah.hn, fernando.zorto@unah.edu.hn*

Abstract*—Aerospace engineering projects require strict control of laboratory access, inventory traceability, and accountability, particularly during the development of mission-critical hardware, a challenge that is amplified in emerging space programs operating under limited resources and evolving infrastructure. This paper presents a cloud-based access and inventory control system developed using Google Apps Script and Google Sheets within Proyecto Morazán, the first national satellite development initiative of the country. The system was conceived as a mission-driven mitigation mechanism to support traceability and operational awareness during laboratory activities, rather than as a standalone software product. The proposed solution follows a serverless, socio-technical approach that combines automated validation with defined human oversight and has been validated through sustained use in an engineering laboratory supporting the ongoing development of the Engineering Model, with recent adaptations introduced to prepare for clean room operations. Results indicate improved visibility of laboratory activity, clearer component usage records, and reduced operational uncertainty during periods of increased activity, demonstrating that low-cost, cloud-based systems aligned with mission-level requirements and Human-in-the-Loop principles can effectively support access control and inventory traceability in emerging aerospace programs.

Keywords*— Aerospace engineering, Socio-technical systems, Emerging space programs, Traceability, Mission-critical hardware.

I. Introduction

Aerospace engineering projects are demanding by nature. Even in their early stages, they require a high level of discipline, coordination, and responsibility, particularly when mission-critical hardware is involved [1],[2]. While satellite projects often focus on flight systems, payloads, and subsystems, a significant portion of the work — and many of the risks — reside in ground-based activities, such as laboratory access, hardware handling, and day-to-day operational control.

In emerging space programs, these aspects tend to receive less formal attention, not by choice, but due to practical constraints[3]. Limited infrastructure, reduced budgets, and small multidisciplinary teams are common realities, yet expectations regarding reliability, traceability, and accountability remain high [4]. In this context, engineering teams are often required to enforce order and visibility using informal procedures or lightweight digital tools, which may become insufficient as activities intensify and more people interact with shared resources [5].

The scope of this case study is limited to the initial deployment phase within the Engineering Model Laboratory (LabEm) from July to December 2025. During this six-month period, the system supported preliminary satellite component exploration and initial electrical testing, serving as a critical pilot stage before the project's transition to formal clean room integration activities.

A. Proyecto Morazán Overview

Proyecto Morazán (Project Morazán), the first national satellite development initiative of Honduras, was developed under these conditions [6]. From the outset, the project involved multiple operational areas and shared laboratory environments, with sensitive components being handled by different team members across parallel activities. As the project progressed, it became increasingly clear that relying solely on informal coordination or loosely structured records was not sustainable for an aerospace project aiming to meet higher standards of discipline and traceability.

Rather than pursuing complex or costly laboratory management platforms, the project adopted a pragmatic approach. A cloud-based access and inventory control system was designed to support existing laboratory procedures and operational practices, not to replace them. The objective was to introduce a simple digital layer capable of providing visibility, accountability, and traceability, while remaining flexible enough to adapt to evolving project needs and operational constraints.

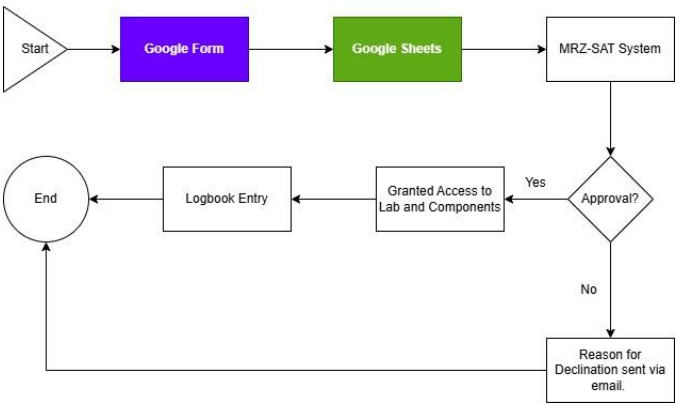

Fig. 1 High-level conceptual architecture of the system.

The system was deployed in July 2025 and has since been used continuously in the engineering laboratory supporting the development of the satellite's Engineering Model. Its sustained use under real working conditions allowed the team to observe limitations, introduce improvements, and progressively adapt the system as requirements evolved. As the project advances toward clean room operations and higher levels of integration, these adaptations are currently being extended to support stricter operational environments.

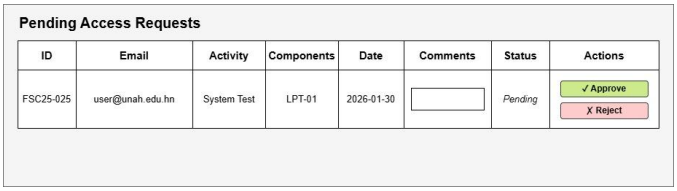

Fig. 2. Administrative interface example for reviewing and approving access requests.

This paper makes the following contributions:

- We present a lightweight, cloud-based access and inventory control system built with Google Apps Script and Google Sheets to support laboratory operations in an emerging national satellite program.
- We formalize a socio-technical HITL (Human-in-the-Loop) operational model that combines automated validation with defined oversight roles to improve traceability and accountability [7].
- We report lessons learned from sustained deployment in the Proyecto Morazán engineering laboratory (since July 2025), highlighting design choices that supported adoption and iterative evolution.

II. System Architecture and Operational Framework

The access and inventory control system developed for Proyecto Morazán was conceived as a practical response to day-to-day laboratory operations rather than as a standalone software product. From the outset, the goal was to support traceability of laboratory activities in a way that could be readily adopted by the team, remain reliable over time, and evolve as project requirements changed. This perspective influenced both the technical architecture of the system and how it was embedded into the project's operational practices.

Instead of relying on complex infrastructure, the system was built using a serverless, cloud-based architecture on a platform that offers a free, quota-limited tier for application development [8],[9]. This decision reduced deployment overhead and maintenance effort while keeping the system accessible through standard web browsers. The architecture was intentionally kept simple, prioritizing functional clarity and robustness over architectural sophistication.

A. Overall System's Architecture

At a high level, the system is composed of three main layers: a backend logic layer, a data storage layer, and a user interaction layer. These layers operate together to provide access control, component tracking, and real-time visibility of laboratory activity.

The backend logic is implemented using Google Apps Script, which handles data validation, access rules, and interaction with the underlying database [10]. Google Sheets is used as the primary data repository, storing user authorization records, access logs, component usage entries, and current system state information such as active users and components in use. While not a traditional database system, this approach proved sufficient for the scale and operational demands of the project, particularly when combined with structured access logic and controlled data flows.

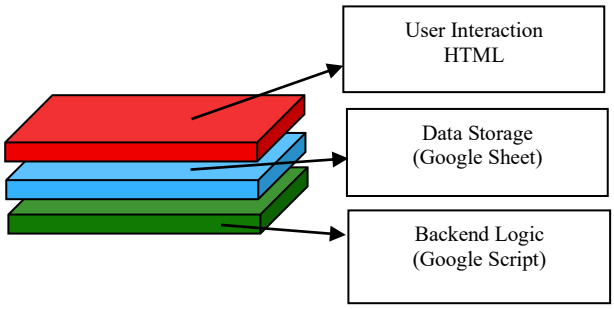

Fig. 3 High level Layers

The user interaction layer consists of web-based interfaces developed with HTML and JavaScript. These interfaces allow users to register laboratory entry and exit events, log component usage, and interact with the system using familiar tools. QR codes are used to facilitate quick access to the laboratories, reducing friction during daily laboratories operations.

To address a potential data concurrency and integrity issues inherent in non-relational environments like Google Sheets, the system employs a dual layer mitigation strategy. Technically, Google Apps Script's execution environment provides basic isolation for individual requests. However, the primary mechanism for ensuring data integrity is socio-technical. The system's HITL model and the closed nature of the laboratory access ensure that only one authorized user interacts with the registry interface at any given time. This procedural 'locking' effectively prevents simultaneous write requests, maintaining a consistent and sequential data flow without the need of complex database locking protocols for the scale of the laboratory operations.

B. Access Control Mechanism

Access control is implemented through a structured check-in and check-out process. Before an access event is recorded, the system verifies that the user is authorized and that no active session already exists for that individual. This mechanism prevents duplicate entries and ensures that the set of active users in the laboratory can be identified at any given time.

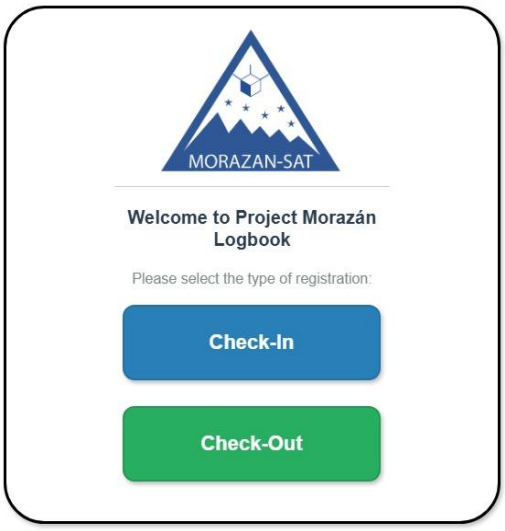

Fig. 4 Check-in and Check-out portal

Rather than attempting to enforce all constraints purely through automation, the system was designed to operate alongside a formal operational protocol. A designated operational role is responsible for supervising access compliance and ensuring alignment between digital records and physical laboratory practices. This combination of automated validation and human oversight is consistent with common practices observed in aerospace laboratory environments, where procedural discipline and responsibility cannot be fully delegated to software alone.

C. Inventory Tracking and Traceability

Inventory tracking within the system is directly linked to user access status. Once a user is registered as active in the laboratory, the system enables the logging of one or more components being handled during the session. Each component entry is explicitly associated with the responsible user and is assigned an individual timestamp, allowing accurate reconstruction of sequences.

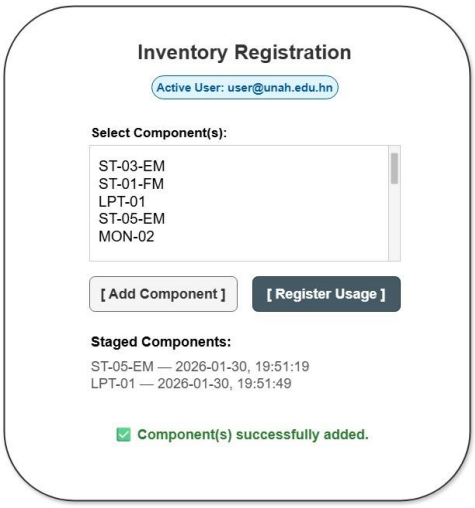

Fig. 5 Inventory registry form example

Components remain marked as active until their use is formally concluded. This mechanism provides continuous visibility into which components are currently in use and by whom, reducing ambiguity during parallel activities and supporting accountability across shared laboratory environments. Over time, the accumulated records form a structured historical log that can be consulted during troubleshooting, integration reviews, or failure analysis activities. This emphasis on consistent record-keeping and traceability aligns with established quality management practices [11].

In practice, the level of traceability provided by this approach became especially valuable in the aerospace engineering context of the project, where knowing who handled a component, when and under what conditions directly supports disciplined laboratory work and smoother progression toward later integration stages.

D. Operational Integration and HITL Approach

From an operational perspective, the system was designed to function as part of a socio-technical framework rather than as a fully autonomous solution. While automated validation mechanisms enforce access rules, session status, and data consistency, defined oversight roles remain integral to daily operation. This design follows a Human-in-the-Loop (HITL) approach, in which software supports decision-making and record-keeping without replacing human responsibility.

In practice, a designated operational role supervises compliance with access and inventory procedures, ensuring alignment between digital records and physical laboratory activity. This combination of automated control and human oversight was a deliberate design choice driven by the mission's traceability and accountability requirements, recognizing that certain responsibilities in handling mission-critical hardware must remain under human control.

Rather than treating human intervention as a limitation, the system explicitly incorporates it as a design feature. This approach was intended to improve user acceptance and reinforce disciplined behaviour while maintaining the flexibility needed to address situations that cannot be anticipated—or enforced—solely through automated logic.

E. System Evolution and Scope

Since its initial deployment, the system has evolved through incremental improvements driven by observed usage patterns, operational feedback, and changing project requirements. Core functionality related to access control and inventory tracking has remained stable, while adaptations have been introduced to support increasingly stringent operational contexts.

As Proyecto Morazán progresses towards cleanroom activities associated with the assembly of the Engineering Model (EM) and, subsequently, the Flight Model (FM), recent modifications have been implemented to accommodate stricter procedural constraints. Current testing efforts are focused on validating these enhancements and ensuring compatibility

with clean room operational practices, while preserving the system's original simplicity and reliability.

It is important to note that the system is intended to support ground-based development and integration activities and is not part of any flight or mission-critical software stack. Within this scope, the architecture and operational framework are sufficiently general to be implemented in other laboratories or clean room environments with similar traceability, access control, and accountability requirements, beyond the specific context of Proyecto Morazán. More advanced automation mechanisms, such as hardware-based identification or physical access enforcement, have been intentionally deferred and are considered part of future extensions rather than core system requirements.

III. Case Study: Proyecto Morazán

A. Project Context and Operational Background

Proyecto Morazán is the first national satellite development initiative of Honduras and represents a large-scale engineering effort developed under strict mission timelines and limited operational margins. Beyond the technical challenges associated with satellite development, the project required the establishment of disciplined operational practices to support laboratory activities, component handling, and accountability across multiple project areas. From early stages, access to laboratory spaces and the use of satellite components were governed by a formal authorization process. Users requiring access to the laboratory or specific components submitted formal requests through Google Forms, which generated records in Google Sheets. These requests specified the intended activity, requested dates, and scope of work. Notifications were automatically sent to both the requester and the project director, who was responsible for approving or rejecting access requests. This process provided an initial layer of planning, authorization, and visibility at the project management level.

The data generated by this approval workflow later became one of the foundational inputs for the access and inventory control system, allowing planned activities and authorized users to be referenced during laboratory operations.

The operations during the reported period focused on the 'LabEm' environment, a specialized space dedicated to component level verification and preliminary hardware tests. Unlike high-cadence development phases, these exploratory activities involve a smaller team and longer intervals of bench top analysis, which explains the controlled number of access events and inventory transactions recorded during this stage.

B. Engineering Model Laboratory Operations Prior to System Integration

Once an access request was approved and the scheduled date arrived, laboratory operations followed a structured but largely human-driven process. Authorized users had one-time access to a project logbook portal on the approved day, where they were expected to document their work. Upon arriving at the laboratory, users followed a defined entry protocol and encountered a QR code that directed them to the access registration interface.

Through this interface, users could register either entry or exit events. The system enforced basic logical validation, such as preventing duplicate entry records and prompting users to register an entry before attempting to log an exit. At the operational level, laboratory access and protocol compliance were supervised by two primary human roles: the project director, responsible for authorizing access, and an engineer acting in a project management capacity, responsible for operational follow-up, key handling, and protocol enforcement during laboratory activities.

Component usage was managed through a separate portal, permanently available on the laboratory workstation. Users authenticated with their credentials and, provided they had approved access, were able to register the components they handled during their session. This ensured that component usage was at least partially documented, although the process relied heavily on correct and consistent user interaction.

C. Anticipated Operational Risks and Design Motivation

As the project progressed, the primary operational concern was not related to an uncontrolled increase in the number of users or components, both of which remained relatively bounded. Instead, the project team identified, in advance, a different category of risk associated with operational resilience. As laboratory activity intensified and timelines became increasingly constrained in preparation for clean room operations, the concentration of responsibilities among a limited number of key roles emerged as a potential point of fragility.

This assessment was conducted proactively, before any operational failures occurred. The transition toward clean room activities introduced a clear countdown toward the planned completion of the Engineering Model (EM) and, subsequently, the Flight Model (FM), both of which remain under active development at the time of writing. While confidence in the technical capability of the team remained high, it became evident that traceability and mitigation mechanisms needed to be strengthened to ensure that increasing time pressure and parallel activities would not compromise mission objectives.

An additional factor influencing this assessment was the composition of the project team. Except for the project director, most contributors—including personnel performing laboratory supervision and project management functions—participate on a voluntary basis as part of a public university initiative at UNAH. This characteristic introduced natural variability in availability and continuity, increasing the importance of reducing dependence on informal coordination, or individual memory.

Under these conditions, the central concern was not task execution itself, but the project's ability to reconstruct events with sufficient clarity in the event of anomalies, delays, or component-related issues. Relying on fragmented records or verbal communication was considered an unacceptable risk as the mission approached more time-critical and procedurally constrained phases.

D. Mission-Driven Traceability Requirements

In response to these concerns, traceability and mitigation were established as central design criteria for the access and inventory control system. The system was explicitly designed to ensure that critical operational information would always be available and consistently recorded. Specifically, the project identified a set of non-negotiable records that needed to be captured during laboratory operations: who accessed the laboratory, when access occurred and for how long, which components were used or manipulated, the purpose of the activity, the work performed, observations made during execution, whether the intended objective was achieved, and what the next steps would be. These records were intended to reduce the likelihood of unregistered events, lost components, or unresolved anomalies without a clear operational history.

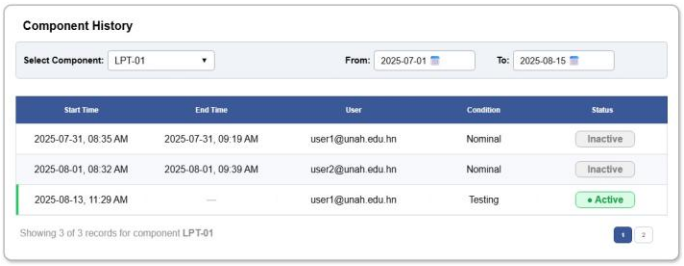

Fig. 6 Component specific registry view example

Rather than treating traceability as a purely administrative requirement, it was approached as a mission-level necessity to support risk mitigation and informed decision-making throughout the development lifecycle.

E. Operational Impact and Team Adaptation

Following sustained use of the system, the most significant changes were observed at the operational coordination level. Given the scale and national importance of the mission, the introduction of the system did not necessarily translate into a subjective sense of reduced workload or increased calm. However, it did result in a measurable reduction in operational uncertainty. At any given time, project leadership could clearly identify ongoing activities, laboratory occupancy, and component usage without relying on ad hoc communication.

The availability of structured, centralized records improved communication flows across the project hierarchy. Information related to access, component handling, and activity status propagated consistently from the project director downward, reducing the need for repeated permission requests, status inquiries, or informal confirmations. This clarity enabled greater autonomy during daily operations while preserving alignment with project-level oversight and mission requirements.

As the team became more familiar with this mode of operation, confidence increased regarding the transition toward clean room activities. Ongoing improvements to the system—including refinements to the user interface, strengthened validation logic, improved data consistency, and full centralization within a single platform—were perceived as key enablers for maintaining discipline under stricter operational constraints.

While some contributors with prior experience in other aerospace environments initially perceived the level of procedural control as unusual, particularly when compared to practices in different cultural contexts, adaptation occurred over time. In practice, these contributors recognized the value of the system once its role in supporting traceability, mitigation, and continuity—especially within a volunteer-based project structure—became evident.

F. Case Study Summary

The experience of Proyecto Morazán illustrates how access control and inventory traceability can be treated as proactive engineering concerns rather than reactive administrative tasks. By anticipating operational risks associated with increasing activity density and mission timelines, the project implemented a socio-technical system designed to support mitigation, accountability, and disciplined laboratory practices.

This case study highlights the importance of aligning operational systems with mission-level requirements in emerging space programs, where resilience, clarity, and traceability play a critical role in enabling technical success.

IV. Results and Validation

The access and inventory control system has been validated through sustained operational use rather than through isolated testing scenarios. Since its deployment in July 2025, the system has been used continuously as part of routine laboratory activities supporting the development of the Engineering Model. Validation, in this context, is based on observed operational outcomes, consistency of use, and the system's ability to support mission-level requirements under real working conditions.

For transparency and reproducibility, we recommend reporting a minimal set of operational metrics (Table I). These can be computed directly from the system logs without collecting additional personal data.

One of the most immediate results observed was improved real-time visibility of laboratory activity. Project leadership and operational supervisors were able to determine, at any given moment, who was working in the laboratory, which components were being handled, and the status of ongoing activities. This visibility reduced uncertainty during periods of high activity and enabled more informed coordination without relying on direct verbal confirmation or constant supervision.

Table I summarizes the operational metrics for the July to December 2025 period. While the sample size (n=25 sessions) reflects the specialized and exploratory nature of the preliminary electrical tests performed in LabEm, the 100% success rate in the data quality demonstrates the system's reliability from a Human-in-the-Loop standpoint.

TABLE I.
OPERATIONAL METRICS REPORT

Metrics	Definition	Value
Adoption	Number of active users over the reporting period.	5
Usage	Number of access sessions (check-in/out pairs) logged	25
Traceability	Number of component check-outs logged	52
Data quality	Share of sessions with successful check-out	100%
Latency	Median time to record a check-in/out even	10 s

These entries represent the totality of formal laboratory sessions during the EM's hardware exploratory phase, providing a record of every component interaction prior to the development of Engineering and Flight Models.

The system also contributed to improved traceability of component usage. By explicitly linking laboratory access, component handling, and activity logging to individual users, the project established a clearer operational record of who interacted with which components, when, and for what purpose. While the system was not designed to prevent all potential anomalies, it significantly reduced ambiguity when reviewing past activities or assessing the context of observed issues.

From an operational standpoint, the integration of access control and inventory tracking into daily workflows proved effective. Users consistently interacted with the system as part of their routine activities, indicating that the design did not impose excessive administrative overhead. The combination of automated validation and human oversight allowed procedures to be enforced without rigid automation that could disrupt laboratory work.

As the project transitioned toward clean room preparation, recent system modifications—focused on user interface refinement, stronger validation logic, improved data consistency, and full platform centralization—have been undergoing testing. Although clean room operations are still in progress at the time of writing, preliminary use of these enhancements suggests that the system can adapt to stricter procedural environments while maintaining usability and operational clarity.

Overall, validation of the system is supported by its sustained use, continued evolution, and acceptance within the project as a reliable operational tool rather than an external reporting requirement.

V. Discussion and Lessons Learned

The experience of implementing and operating the access and inventory control system within Proyecto Morazán offers several insights relevant to emerging aerospace programs. One of the primary lessons learned is the value of treating operational traceability as a proactive design requirement rather than a reactive administrative task. By anticipating potential points of operational fragility early, the project was able to introduce mitigation mechanisms before failures occurred.

Another important observation is the effectiveness of a socio-technical approach. Rather than attempting full automation, the system was intentionally designed to support Human-in-the-Loop operation. Automated validation handled logical consistency and record-keeping, while human oversight remained responsible for procedural discipline and context-sensitive decision-making. This balance proved particularly appropriate for an aerospace development environment involving mission-critical hardware and evolving operational conditions.

The project also demonstrated that low-cost, cloud-based tools can be sufficient to support disciplined operations when combined with clear protocols and defined responsibilities.

While commercial Laboratory Information Management Systems (LIMS) or sophisticated Enterprise Resource Planning (ERP) platforms offer robust traceability for established space agencies, their implementation in emerging programs is often prohibitive. These traditional solutions typically demand substantial financial investment, dedicated on-premise IT infrastructure, and extensive user training. Conversely, open-source alternatives still require continuous server maintenance and specialized database administration. In contrast, the approach adopted by Proyecto Morazán leverages existing, quota-free cloud infrastructure (Google Workspace). This minimizes deployment overhead and eliminates server maintenance costs, providing a pragmatic 'middle ground' that fulfills the core traceability and accountability requirements of mission-critical hardware without the burden of complex enterprise software.

The use of Google Apps Script and Google Sheets enabled rapid development, easy modification, and minimal maintenance, which aligned well with the resource constraints of an early-stage space program. Importantly, the perceived simplicity of the tools did not limit their effectiveness when used within a structured operational framework.

Team composition further influenced system design and outcomes. With most contributors participating on a voluntary basis within a public university context, ensuring continuity and reducing reliance on informal knowledge transfer became essential. Centralized records and consistent workflows helped mitigate variability in availability and supported operational resilience as project activity intensified.

Cultural differences in prior aerospace experience also surfaced during system adoption. While some contributors initially perceived the level of procedural control as unusual, adaptation occurred as the value of structured traceability became evident. Over time, the system was recognized not as a constraint, but as an enabler of clearer communication, accountability, and confidence when operating under increasing mission pressure.

Finally, continuous iteration emerged as a key factor in system success. Rather than aiming for a finalized solution from the outset, the system evolved in response to real usage, feedback, and changing operational requirements. This

iterative approach allowed the project to preserve flexibility while steadily improving alignment with mission objectives.

VI. Limitations and Future Work

A. Limitations

While the access and inventory control system has demonstrated its usefulness through sustained operation, several limitations should be acknowledged. First, the system has been designed exclusively to support ground-based development and integration activities and does not provide physical access enforcement. Compliance with access and handling procedures continues to rely on established protocols and human supervision, which remains a deliberate design choice aligned with the project's Human-in-the-Loop approach.

Second, although recent adaptations have been introduced to support clean room operations, full validation under long-term clean room conditions is still ongoing at the time of writing. Current testing efforts focus on assessing usability, procedural alignment, and data consistency under stricter operational constraints. As such, conclusions regarding clean room performance should be interpreted as preliminary and subject to further confirmation as operations progress.

Another limitation relates to the scope of automation. The system currently depends on manual user interaction for access registration and component logging. While this approach preserves flexibility and situational awareness, it may introduce opportunities for human error or delayed data entry. Future work includes the integration of automated identification technologies, such as RFID, to reduce cognitive load and further strengthen traceability without removing human responsibility from the operational loop.

B. Threats to Validity and Mitigation

The primary threats to validity stem from the case-study nature of the evaluation where data integrity depends heavily on human behaviours and organizational norms. Specifically, user negligence – such as failing to log exit events or component interactions – could lead to discrepancies between digital records and actual laboratory activity.

To mitigate these risks, a multi layered oversight protocol was implemented. In this system, the operational supervisor responsible for granting physical and digital permissions received real-time notifications for every access request. This was supplemented by continuous environmental recording within the laboratory space. This combination allowed for remote monitoring and post activity audits, ensuring that digital records remained strictly aligned with physical practices, even in the supervisor's absence.

In addition, the use of Google Workspace introduces external dependencies (connectivity, availability, and quota limits) that may differ across institutions; however, the oversight protocol ensures that the primary behavioural threats to data quality are systematically addressed.

C. Future Work

From a technical perspective, the use of cloud-based tools introduces dependencies on network connectivity and platform availability. Although these constraints have not posed significant issues during laboratory operations, they represent considerations for broader deployment or replication in environments with limited connectivity or stricter cybersecurity requirements.

Following the conclusion of the LabEm phase in December 2025, the system transition to a significant UI redesign to accommodate the stricter protocols of a clean room, which officially started operations in March 2026.

Future development efforts will focus on refining system robustness, enhancing user experience with an architectural migration while also evaluating the applicability of the approach in additional laboratory contexts. Extending the system to support other project environments with similar operational requirements will further assess its generalizability beyond the specific case of Proyecto Morazán.

VII. Conclusions

This paper presented the design, implementation, and operational validation of a cloud-based access and inventory control system developed for Proyecto Morazán, the first national satellite development initiative of the country. The system was conceived as a pragmatic response to mission-level requirements for traceability, accountability, and mitigation, rather than as a standalone software product.

Through sustained use in an engineering laboratory environment, the system demonstrated its ability to improve operational visibility, support disciplined component handling, and reduce uncertainty during periods of increasing activity and time pressure. Its effectiveness derives not from extensive automation, but from the intentional integration of automated validation with human oversight within a socio-technical operational framework.

The experience documented in this case study highlights the importance of addressing operational and organizational challenges early in the lifecycle of emerging space programs. By aligning access control and inventory traceability with mission objectives, and by leveraging low-cost, serverless cloud technologies, it is possible to establish resilient operational practices even under constrained resources and volunteer-based team structures.

Beyond Proyecto Morazán, the architecture and operational principles presented in this work offer a reference for other laboratories and clean room environments with similar requirements. While further validation and enhancements are ongoing, the results suggest that lightweight, adaptable systems can play a meaningful role in supporting aerospace engineering activities and enabling mission success in early-stage space initiatives.

Acknowledgment

We want to thank the Applied Sciences and Technology Research Institute (IICAT) in the National Autonomous University of Honduras (UNAH) for the support given during the development of and deployment of the system.

REFERENCES

[1] J. Reason, Human Error. Cambridge, U.K.: Cambridge University Press, 1990.
[2] I. Sommerville, Software Engineering, 10th ed. Boston, MA, USA: Pearson, 2016.
[3] United Nations Office for Outer Space Affairs (UNOOSA), Guidance on Space Activities for Emerging Space Nations, Vienna, Austria, 2018.
[4] European Cooperation for Space Standardization (ECSS), ECSS-M-ST-40C: Configuration and Information Management, ESA, 2009.
[5] National Aeronautics and Space Administration (NASA), NASA Systems Engineering Handbook, NASA/SP-2016-6105 Rev2, 2016.
[6] L. Monge, C. Alvarado-Briceño, M. Molina, F. J. Zorto Aguilera, E. J. Gross Muñoz, J. Mejuto, V. C. Hernández, M. Becker, O. Sierra, and J. Cabrera, "Morazán MRZ-SAT CubeSat project for integration of the Central American Nations through collaboration in space," in Proc. 70th International Astronautical Congress (IAC), Washington, DC, USA, Oct. 2018.
[7] M. Baxter and I. Sommerville, "Socio-technical systems: From design methods to systems engineering," Interacting with Computers, vol. 23, no. 1, pp. 4–17, 2011.
[8] P. Mell and T. Grance, "The NIST definition of cloud computing," NIST Special Publication 800-145, 2011.
[9] E. Jonas et al., "Occupy the cloud: Distributed computing for the 99%," Proc. ACM Symposium on Cloud Computing, 2017.
[10] Google, "Google Apps Script Documentation." [Online]. Available: https://developers.google.com/apps-script
[11] International Organization for Standardization, ISO 9001:2015 – Quality Management Systems—Requirements, Geneva, Switzerland, 2015.