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Elevating Ground System Products with UX/UI Design

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Abstract

The integration of User Experience (UX) and User Interface (UI) design in aerospace product development has become a pivotal factor in enhancing the efficiency and effectiveness of Ground System solutions. This paper discusses GMV Space's pioneering approach to incorporating human-centric design methodologies, demonstrating how collaboration between UX/UI teams and systems engineering has led to more intuitive, cost-effective, and competitive products. Key results show significant improvements in product development time, risk reduction, and alignment with user needs. The research highlights the impact of UX/UI design on several major products, including the Eutelsat Flight Operations Management system FOPit, GMV Prodiggi® for Earth Observation Constellations, and GMV Flyplan, an orchestrator for full ground segment operations. Central to this success is the application of Design Thinking, Design Sprints, and Lean UX, from project inception through to the final design and implementation stages. The use of prototyping has also proven essential, allowing for rapid iteration and cost-effective testing, which accelerates decision-making. Furthermore, the implementation of a unified Design System has streamlined the development process, enhancing consistency and reducing the complexity of multi-product solutions. This research emphasizes that in the aerospace industry, UX/UI design is not just an enhancement but a critical component for delivering high-quality, user-centered solutions that meet both technological and operational requirements.

Keywords: User Experience, User Interface, Aerospace, Product Development, Design Thinking, Prototyping

Acronyms/Abbreviations

UX: User Experience

UI: User Interface

1. Introduction

In the aerospace industry, the development of ground systems has traditionally prioritized technical performance, reliability, and engineering rigor. While these aspects remain fundamental, the growing complexity of systems and the increasing expectations of end-users have revealed significant limitations in purely engineering-driven approaches. User Experience (UX) and User Interface (UI) design, long embraced in sectors like consumer technology and web applications, are now emerging as crucial components in the space domain as well. At GMV Space, this recognition has sparked a strategic transformation in how ground segment solutions are conceived, designed, and developed.

This paper explores how the integration of UX/UI practices within the ground systems lifecycle leads to better outcomes. The collaboration between UX designers, UI specialists, and systems engineers enables a shared understanding of user needs from the earliest stages of development. This shift to a human-centered design approach has already shown tangible benefits across several flagship projects, including Eutelsat FOPit, GMV Prodiggi®, and GMV Flyplan. These products showcase how UX/UI methodologies, when properly applied, can act as accelerators of innovation and operational excellence in the aerospace sector.

2. Methodologies used

The integration of UX/UI into GMV Space's development processes is grounded in well-established design frameworks tailored to the unique constraints of the aerospace sector. Among the most impactful are Design Thinking, Lean UX, and Design Sprints—all of which foster rapid ideation, validation, and iterative improvement while keeping the user at the core of every decision.

2.1 Design Thinking

Design Thinking is a user-centered approach to problem solving that emphasizes empathy, creativity, and iterative learning. At GMV Space, it serves as the foundational mindset through which UX/UI teams engage with complex engineering problems. The methodology typically unfolds in five distinct, non-linear phases: Empathize, Define, Ideate, Prototype, and Test.

- **Empathize:** This phase begins with user research, often through interviews, surveys, and direct observation of operators and system users in real-world contexts. The objective is to gain a deep understanding of users’ pain points, workflows, and goals—especially in environments where stress, complexity, and mission-critical decisions are the norm. In the case of ground systems, this might involve shadowing satellite controllers or data analysts during operational shifts.
- **Define:** The insights gathered are synthesized into clear problem statements, user personas, and journey maps. These artifacts help align teams around the users’ real needs. For example, a typical definition might identify that “Satellite operators lack a unified view of critical telemetry data during anomaly resolution,” providing a clear direction for design work.
- **Ideate:** Cross-functional brainstorming sessions are held to generate a wide range of possible solutions. Techniques such as “Crazy 8s,” mind mapping, and “How Might We” questions are used to push beyond obvious solutions. The presence of engineers and domain experts in these sessions is vital to ensure that creative ideas remain technically grounded.
- **Prototype:** Initial ideas are translated into low- or mid-fidelity prototypes using tools like Figma, Sketch, or even paper sketches. These prototypes simulate user flows and interactions without the overhead of full development, allowing rapid experimentation.
- **Test:** Prototypes are tested with real users or stakeholders through usability sessions or walkthroughs. Feedback is gathered early and often, allowing iterative refinements before committing to code. This phase may be repeated multiple times as the design evolves.

At GMV, Design Thinking is not a separate phase but a continuous loop, guiding decisions from project kickoff to final delivery. It also helps foster a culture of empathy and creativity within multidisciplinary teams.

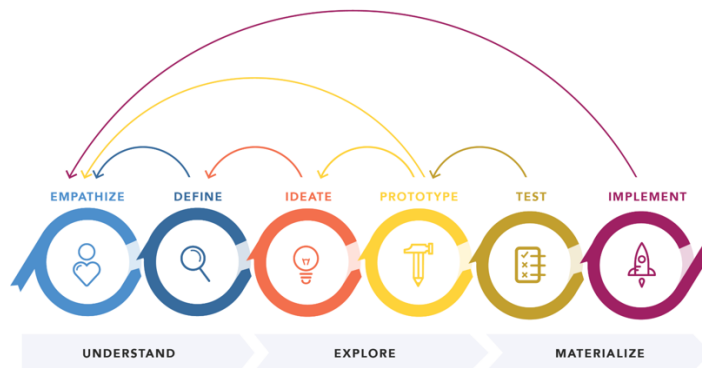


Fig.1 - Design Thinking diagram

2.2 Lean UX

Lean UX complements Design Thinking by focusing on rapid experimentation, minimal documentation, and cross-functional collaboration. It is particularly suited to agile environments where flexibility, speed, and learning are prioritized over detailed upfront requirements.

In GMV Space projects, Lean UX begins by framing each design challenge as a hypothesis. For instance: “We believe that creating a collapsible dashboard panel will allow operators to access telemetry faster and reduce clutter during anomaly handling.” This hypothesis is paired with assumptions, metrics for validation, and a Minimum Viable Design (MVD)—a simplified prototype that embodies the concept.

Lean UX practices include:

- **Collaborative Design:** Instead of designers working in isolation, design work is conducted alongside developers, engineers, and business analysts through co-design sessions. This reduces hand-off errors and promotes shared ownership.
- **Quick Iterations:** Instead of large, monolithic design deliveries, work is broken into small pieces that can be tested and improved iteratively. For instance, a feature might go from sketch to testable prototype within a few days, and be refined based on immediate feedback.
- **Outcome-Driven Development:** Success is measured not by deliverables but by impact. Usability KPIs, such as time-on-task, error rates, or user satisfaction scores, are tracked throughout the process to ensure that design solutions are genuinely improving user experience.

At GMV, Lean UX is used to reduce the overhead of formal specifications and speed up time-to-validation, especially in early-stage projects or proof-of-concept phases where direction is still fluid.

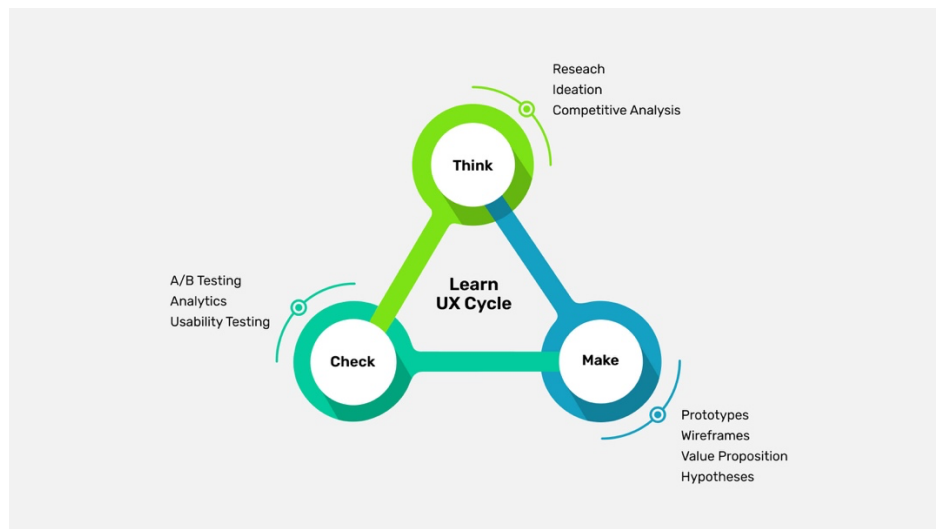


Fig.2 – Lean UX diagram

2.3 Design Sprints

Design Sprints are structured, time-boxed workshops—typically lasting five days—that allow teams to solve specific design challenges and validate ideas quickly. Originating from Google Ventures, the methodology is ideal for aligning multiple stakeholders around a shared problem and fast-tracking decision-making.

At GMV Space, Design Sprints are often used when facing high-risk design challenges, such as the launch of a new product interface, a reimagining of a legacy system, or the creation of a new feature with high user impact.

A typical GMV Design Sprint might look like this:

- **Day 1 – Understand & Map:** Stakeholders (UX/UI designers, engineers, product owners, and sometimes clients or end-users) come together to define the challenge, business goals, and user needs. A user journey map is created to visualize pain points and opportunities.
- **Day 2 – Sketch & Conceptualize:** Participants individually brainstorm and sketch possible solutions. These are later shared and critiqued in a group setting.
- **Day 3 – Decide & Storyboard:** The team votes on the best ideas and builds a detailed storyboard of the solution. This acts as a blueprint for the prototype.
- **Day 4 – Prototype:** Designers build a realistic, interactive prototype simulating the proposed solution. Tools like Figma or Adobe XD are typically used, ensuring the prototype feels as close as possible to a working product.
- **Day 5 – Test:** The prototype is tested with real users. Feedback is collected on usability, clarity, and value. These findings guide the next phase of product development—whether to proceed, pivot, or revisit the design.

At GMV, Design Sprints are often adapted depending on the scope and availability of resources. For example, the process might be compressed into three days or extended across two weeks in parallel with ongoing development work.

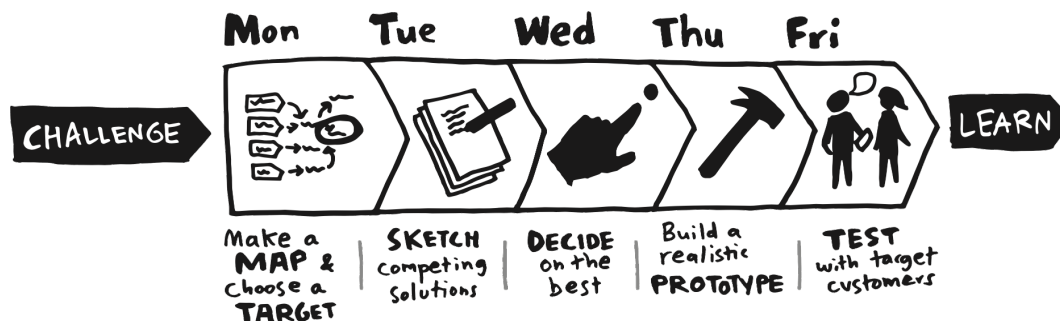


Fig.3 – Design Sprint diagram

2.4 Design System

An essential pillar supporting the success of these initiatives has been the implementation of a unified Design System. This system provides a centralized library of reusable components, interaction patterns, and visual guidelines that ensure consistency, scalability, and efficiency across all GMV Space applications. By standardizing design decisions and UI elements, the Design System has significantly reduced development time and complexity, allowing teams to focus more on functionality and user needs rather than reinventing interface elements for each new project. In large-scale and multi-product environments like Eutelsat FOPit, Prodigy®, and Flyplan, it has enabled seamless integration, improved user onboarding, and a coherent experience across platforms. Furthermore, it fosters collaboration between designers and developers by serving as a shared source of truth, ultimately accelerating delivery cycles and elevating the overall quality of the user experience.

3. Conclusions

The integration of User Experience (UX) and User Interface (UI) design into the development of ground segment systems marks a significant paradigm shift in the aerospace industry. Traditionally dominated by engineering and technical priorities, the sector is now beginning to recognize the transformative value of user-centered methodologies in driving innovation, improving efficiency, and enhancing overall system performance.

At GMV Space, the adoption of structured UX methodologies such as Design Thinking, Lean UX, and Design Sprints has not only reshaped the way products are developed, but has also elevated the role of users in shaping solutions. By embedding these practices early in the development lifecycle, we have been able to identify and resolve design challenges proactively, reduce time-to-market, and significantly improve usability across a range of products.

The practical application of these methodologies has already yielded tangible results in flagship projects such as Eutelsat FOPit, GMV Prodigy®, and GMV Flyplan. In each case, the introduction of UX/UI design principles led to interfaces that are more intuitive, workflows that are more efficient, and systems that are better aligned with user needs. These improvements have translated into reduced training requirements, lower operational risk, faster anomaly resolution, and increased stakeholder satisfaction.

Crucially, the development of a unified Design System has further reinforced these gains by standardizing interface components, enabling scalability across multiple products, and fostering consistency across teams. It has empowered our teams to deliver solutions more quickly and with greater visual and functional coherence.

In a domain where mission-critical reliability and precision are non-negotiable, our experience demonstrates that UX/UI is not a superficial enhancement—it is a strategic asset. Human-centered design has proven essential to building modern, efficient, and user-friendly aerospace systems that meet the demands of both operators and organizations.

Looking forward, we see UX/UI playing an increasingly central role in the digital transformation of space operations. As satellite constellations grow in complexity and ground systems become more interconnected, the ability to design with and for users will be a key differentiator in achieving operational excellence. At GMV, we remain committed to advancing this vision and continuing to pioneer a design-driven future in aerospace.