Safety By Design: Reflections from an Early-Career Engineer



When Beatriz Coutinho graduated with a Master's degree in Aerospace Engineering in 2022, she expected a clear and straightforward transition into an engineering role. Like many other graduates, she imagined herself in a technical role, where she would be designing complex systems, applying all the theories she had spent years learning, and being at the forefront of innovation. The reality proved itself to be more nuanced and far more instructive. Beatriz offers her perspective on entering this profession, some of the lessons she has learned so far, and how safety principles have come to shape not only how she works, but how she thinks.

In the two years since my graduation, my career has taken me through various detours. From roles that felt outside my field to a position that has introduced me to the world of systems and functional safety. Along the way, I have learned that a career is an evolving system and that the best engineers aren't defined by the roles they start in, but by how they learn, adapt, and grow.

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Starting Out: From study to practice

The transition from education to employment often feels abrupt – like you're walking through fog and are not quite sure what's the next right step. Academic work provides a strong technical foundation but can leave uncertainties about how that knowledge translates into professional practice.

In my own case, my first post-university positions were not traditional engineering roles. They sat on the periphery, involving skills like project coordination, data management, and operational support. At the time, I felt like I was drifting away from my goal, yet they proved to be invaluable and formative experiences.

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Those roles introduced me to how organisations function, how to communicate across disciplines, and how to adapt quickly. Those so-called "non-engineering" roles taught me that technical understanding alone is not sufficient, engineering outcomes are a product of systems, processes, people, and culture working in concert. Understanding that interplay has shaped my perspective as I have transitioned into a career in systems and functional safety.

Discovering Safety Engineering

My formal introduction to safety came when I joined **3SK**, a consultancy specialising in systems engineering and functional safety, as a Graduate Project Engineer. Although safety had featured in my studies only in passing, it quickly became central to my daily work, I was introduced to new languages, concepts and frameworks.

Safety engineering is humbling, it asks us not simply to understand how systems operate but to anticipate how they might fail, and to consider the consequences of that failure. It demands technical rigour, but also imagination and empathy. It's about considering not just the systems, but the people that interact with them (e.g., operators, maintainers, and end users).

What struck me most was that safety work is not about achieving perfection, but about designing systems that fail safely, recover predictably, and keep people protected. It is about learning from the evidence, questioning assumptions, and maintaining transparency.

This mindset extends beyond my day-to-day role, it influences how I approach challenges even in my personal life, more as opportunities rather than barriers.

Working as a Woman in Engineering

One thing that became clear early on, is that engineering remains a profession in which women are still underrepresented. During my studies, this disparity was visible in lecture theatres and, when transitioning to the industry, this became evident in meeting rooms and office spaces.

Initially, I viewed this imbalance as something to quietly navigate; I was often cautious in technical discussions, hesitant to voice uncertainty or to question opinions. However, with time and experience I came to realise that confidence is not a prerequisite for contribution but a result of it. Engaging fully, sharing ideas, and asking questions are acts of participation that strengthen both the individual and the team and help normalise the presence of women's voices in technical dialogues.

Representation isn't about being the "only woman in the room" but to ensure you're not the last.

I have been fortunate to work within an organisation that values inclusion and actively promotes it. This support has reinforced my belief that diversity is not simply an ethical aspiration, but a safety asset. In safety-critical engineering, diversity of thought leads to stronger analysis, fewer blind spots, more resilient systems and innovative problem-solving approaches. Fostering psychological safety is therefore as vital to system safety as any technical measure.

Safety in Practice and in People

Over the past two years, I have come to appreciate that safety is as much a way of thinking as it is a discipline. It requires modesty, precision, and continuous reflection. Working on safety-critical projects has reminded me that systems just like people are dynamic; they adapt, they interact, and sometimes they fail. I often associated mistakes with incompetence, but in safety, errors are treated not as personal failings but as data points, simply as new opportunities to understand, improve, and strengthen the system.

Safety work constantly reminds us that no system, procedure, or individual is infallible. My path hasn't been perfectly linear, and I doubt it will ever be. I have had moments of overconfidence, times when I hesitated, and occasions where I underestimated the complexity of a problem. Each instance became part of my personal growth, reinforcing the importance of communication, traceability, and learning.

The longer I work in this field, the more I see that safety is as much about people as it is about processes. Behind every requirement, every standard, and every risk assessment lies the intent to protect lives and that purpose gives meaning to the detail.

Equally, safety depends on culture. The technical frameworks provide structure and discipline, but culture determines how effectively they're applied. I have seen how small acts, like taking time to explain a concept to a colleague, asking a question in a review, acknowledging uncertainty, or simply listening to others allows both safety systems and teams to function far more effectively.

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In this sense, safety by design extends beyond the system itself it encompasses the people and relationships that sustain it.

Key Lessons Learned

- Growth is iterative: Engineering careers, like systems, evolve through feedback and refinement. Each project adds insight that informs the next.
- Safety starts with awareness: The earlier a potential issue is identified, the more manageable it becomes
- Confidence is built, not granted: You rarely feel "ready" before contributing. Taking part, even when uncertain, is how confidence is built
- Diversity strengthens safety: Inclusive teams are not only fairer but demonstrably safer
- Culture matters: Psychological safety and technical safety reinforce each other
- Keep learning, always: Safety is an evolving discipline and continuous learning is its defining principle

Continuing the Journey

Although my time in industry has been relatively short, I see a pattern emerging, one defined less by titles or tasks and more by mindset. I have learned that safety is not a static goal but a continual process more like a mindset, and that the safest systems are those designed with humanity in mind.

Engineering, at its best, is about designing environments where people and systems can operate safely, effectively, and with confidence. As I continue to build my career, I hope to keep contributing to both kinds of safety: the technical integrity of the systems we create, and the cultural integrity of the teams that make them possible. The challenge, and the opportunity, lie in designing systems that are not only safe in operation but created within environments where safety is lived and valued.

Beatriz Coutinho, Project Engineer, 3SK, MEng, MIET, MWES



Beatriz Coutinho is a Project Engineer at 3SK specialising in systems engineering and functional safety. With a master's degree in Aerospace Engineering, they focus on safety analysis, V&V strategies, and the application of modern engineering methods to emerging technologies. Their work includes research, technical writing, and the development of engineering solutions aimed at improving real-world safety and system performance.

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