Transforming Aviation Training Through

SIMULATION AND DIGITAL TWINS

In this exclusive interview with Sundeep Mehta, Editor, Aviation Insights, Payal Gupta discusses how simulation-based training, AI, Virtual Reality, and Digital Twins are transforming aviation workforce development, enhancing operational safety, improving airport efficiency, and preparing the industry for the next generation of airside operations.



Payal Gupta

Co-founder & Director – Business Development, Tecknotrove Systems

Q **Tecknotrove has been delivering simulation-based training solutions for over 25 years. How have you seen aviation training evolve during this period, and what role has simulation played in enhancing operational safety and workforce readiness?**

A Aviation has long used simulation for pilot training, but airside operations were still largely learned live on the apron on real equipment, under pressure, with little room for error.

Tecknotrove changed this by developing hardware-accurate GSE simulators with immersive virtual environments that recreate real apron layouts, aircraft movement, lighting, markings, signage, and traffic conditions in a safe, controlled setting.

This helped shift the industry mindset.



"Simulation-based training is no longer a nice-to-have for airside operations—it is becoming the industry standard for building safer, more efficient aviation workforces."

Airports gained safer, more consistent training; airlines saw better-prepared crews, fewer incidents, and faster turnarounds; and operators could upskill faster while reducing equipment damage and practicing high-risk scenarios without live operational risk.

Twenty-five years on, simulation-based training is no longer a nice-to-have for airside operations; it is becoming the standard. That shift from "pilots only" to the wider ground operations ecosystem is one of the changes we are proud to have been part of.

With airports and airlines under constant pressure to improve turnaround times while maintaining the highest safety standards, how can advanced simulation technologies help bridge the industry's skills gap and reduce operational risks

Turnaround time and safety are often seen as competing priorities, but they are closely connected. Most apron delays and incidents stem from undertrained personnel operating high-stakes equipment under time pressure.

Advanced simulation helps bridge this gap by allowing operators to build muscle memory and decision-making skills for high-pressure scenarios, equipment malfunctions, and adverse weather without the cost or risk of live training on the tarmac.

Our simulators combine hardware realism with detailed software environments covering narrow-body and wide-body aircraft, so operators train on the configurations they will actually encounter. For example, our aircraft pushback simulator trains up to five operators in a single scene, helping teams practice real-time coordination before they are on the ramp.

We also offer aircraft inspection modules that help line maintenance teams practice walkaround checks and identify whether an aircraft is safe to fly.This combination of realism, coordination, and procedural precision helps improve turnaround performance without compromising safety.

Digital transformation is reshaping aviation training through technologies such as Virtual Reality (VR), Artificial Intelligence (AI), and Digital Twins. Which of these

Q innovations do you believe will have the greatest impact over the next five years, and why?

A VR is already mature and delivering strong results where training is experience-based and non-critical. Over the next five years, I believe AI and Digital Twins will have the greatest impact on aviation training.

Digital Twins are especially valuable for MRO because they replicate real aircraft systems and operational data, allowing technicians to train on realistic faults such as engine wear or hydraulic issues without using actual aircraft. At Tecknotrove, we are combining Digital Twins with VR and simulation to create training environments that evolve with the aircraft, helping engineering, maintenance, and planning teams work from one synchronized model.

AI acts as the multiplier. It personalizes training paths, identifies weak areas early, generates adaptive simulator scenarios, supports real-time analytics, and helps automate evaluation and debriefing. It also speeds up content creation and updates as aircraft systems and regulations change.

In short, Digital Twins provide the realistic, data-driven training foundation, while AI makes that foundation adaptive, predictive, and continuously improving.

Q Tecknotrove has developed simulators for a wide range of airside operations, from aircraft ground handling to emergency response. What are the most common training challenges faced by aviation organizations today, and how can simulation effectively address them?

A Tecknotrove addresses a major vulnerability in high-density aviation hubs such as Delhi, Mumbai, Doha, Dubai, and Riyadh where runway incursions and ground collisions stem from coordination gaps and lack of edge-case practice rather than individual skill deficits. By deploying airport-specific digital twins that replicate exact airside layouts, signage, and traffic dynamics,

Tecknotrove enables ground crews, ATC, and emergency teams to conduct joint, realistic training for high-risk scenarios without exposing assets to hazard. This tailored operational rehearsal drives measurably higher procedural retention, directly mitigating costly ground damage, reducing turnaround bottlenecks, and lowering overall operational risk.

Q As airports expand and automation increases, training requirements are becoming more complex. How do you ensure that your simulation solutions remain scalable, customizable, and aligned with evolving international aviation standards?

A Tecknotrove delivers scalable, future-ready simulation platforms engineered on a modular architecture that expands alongside airport growth such as new terminals, fleet additions, or ground equipment without requiring a complete system rebuild.



By incorporating ICAO standards and an airport's specific airside layouts, operational SOPs, and edge cases, Tecknotrove builds high-precision digital twins rather than relying on generic templates. Driven by an in-house R&D team integrating AI analytics and operational feedback, these simulators evolve continuously with regulatory changes and automation trends, ensuring long-term operational relevance and precision training.

Q Sustainability has become a strategic priority for the aviation industry. Beyond improving safety, how can simulation-based training contribute to reducing operational costs, equipment wears and tear, fuel consumption, and the environmental impact of airport operations?

A Tecknotrove's simulation-based training delivers a significant sustainability dividend by replacing live equipment exercises with digital rehearsals for high-risk ground handling, pushback, and emergency procedures. Shifting this practice to simulators cuts fuel burn, lowers carbon emissions, and eliminates unnecessary mechanical wear and tear on ground support equipment and aircraft assets.

By allowing teams to repeatedly rehearse complex manoeuvres and fail safely in a virtual environment, airports extend equipment lifecycles, reduce maintenance costs, and achieve superior workforce readiness without the environmental and resource drain of live field training.

Beyond training itself, the same digital twin data we use for simulation can inform smarter ground operations, optimizing taxi routes, reducing idle time, and minimizing unnecessary vehicle movement. So, simulation isn't just safer, it's a quieter, lower-emission way to build operational excellence, which is exactly the kind of measurable sustainability impact the industry is now expected to show

Q Looking ahead, what is your vision for the future of aviation simulation and training, and what advice would you offer to airports, airlines, MROs, and aviation training institutions planning to invest in next-generation training technologies?

A The future of aviation training requires elevating ground handling from a secondary budget item to core infrastructure, closing the dangerous gap between heavy flight-deck investment and high-risk airside operations. Because ground support equipment (GSE) errors drive the majority of daily delays, damage, and safety incidents, investing in simulation delivers a compelling financial ROI by protecting turnaround times and operational margins.

Ultimately, ground training will evolve into fully connected digital twin ecosystems linking ATC, emergency response, and flight operations through live airport data enabling early adopting hubs to operate safer, leaner, and far more profitably.