

# From virtual to REALITY

Human-centred design has played a vital role in developing rolling stock for Sydney Metro’s Western Sydney Airport line

**A**s the Senior Manager for Human Factors at Sydney Metro, Dr Tara Kazi has championed the integration of human factors principles across Sydney Metro projects since beginning her role. Working in collaboration with Anthony Lenthen and the Customer Experience team, she has supported the development of a human-centred design brief for the Sydney Metro – Western Sydney Airport project.

Sydney Metro – Western Sydney Airport will form a major transport link for Greater Western Sydney, connecting communities with the new Western Sydney International Airport. The new type of rolling stock, that will be a fully automated metro fleet supplied as part of a broader delivery partnership with Siemens, is designed to support high-capacity, efficient travel for the region’s growing population.

Designing public transport interiors requires careful consideration of how diverse passengers move, stand, sit and interact with shared spaces. For a new metro line serving both daily commuters and airport travellers, human factors input was embedded early to ensure the passenger environment supported safety, accessibility and intuitive use across a wide range of users.

A key challenge was that the rolling stock configuration differed from existing metro services, introducing a mix of longitudinal and transverse seating, new vestibule layouts and varied standing

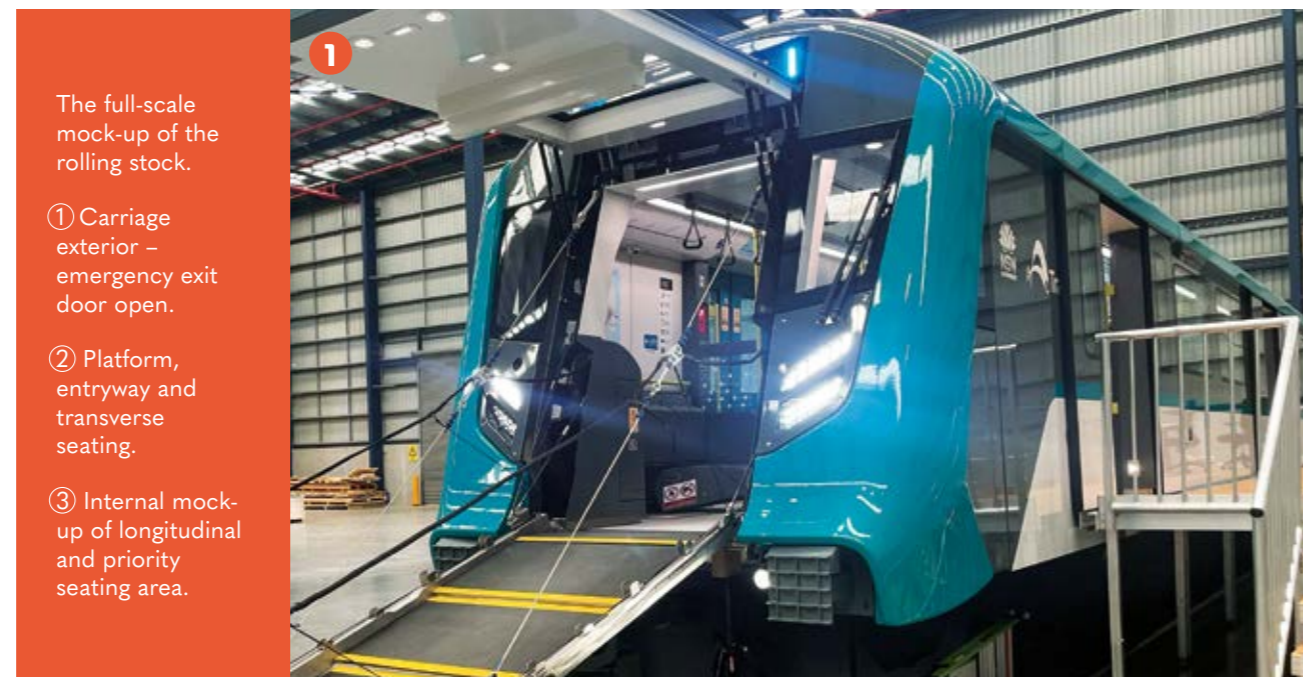
support features. These changes presented both opportunities and risks from an ergonomics perspective.

**An iterative, human-centred approach**  
Rather than relying on a single evaluation method, the design was assessed through a staged process that combined digital

modelling with progressively higher fidelity mock-ups. Early virtual assessments enabled rapid evaluation of layouts, reach envelopes and sightlines, allowing ergonomic issues to be identified before design decisions became fixed.

This was followed by low-fidelity physical mock-ups to explore spatial relationships and passenger movement and, finally, a high-fidelity, full-scale mock-up to verify performance in realistic conditions. This layered approach allowed ergonomic risks to be identified early, tested safely and

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The full-scale mock-up of the rolling stock.

① Carriage exterior – emergency exit door open.

② Platform, entryway and transverse seating.

③ Internal mock-up of longitudinal and priority seating area.



resolved iteratively. Importantly, it also provided a shared reference point for discussion between designers, engineers and human factors specialists.

**Designing for real passengers**

Passenger trials were conducted with a deliberately diverse group, reflecting a wide range of ages, statures, abilities and travel needs. This included wheelchair users, people travelling with luggage, older passengers, shorter and taller users, and those less familiar with metro systems.

Several key findings illustrate the value of this approach. Standing passengers, particularly shorter users, reported confidence in the availability and accessibility of handholds when reach envelopes were verified through digital and physical trials. Taller users highlighted discomfort in early transverse seating designs, leading to refinements that increased knee clearance and improved comfort.

Boarding and alighting experiences were strongly influenced by perceived safety at the train–platform interface. Participants consistently noted that minimal level change and clear visual cues supported confident movement, particularly for those travelling with mobility aids or luggage. These findings reinforced the importance of visual contrast, lighting and alignment – factors that are often underestimated when viewed only in drawings.

**Accessibility beyond compliance**

Mock-up testing also demonstrated how accessibility considerations extend beyond minimum requirements. Wheelchair users were able to manoeuvre independently, identify preferred spaces and adapt their boarding strategy based on real world constraints.

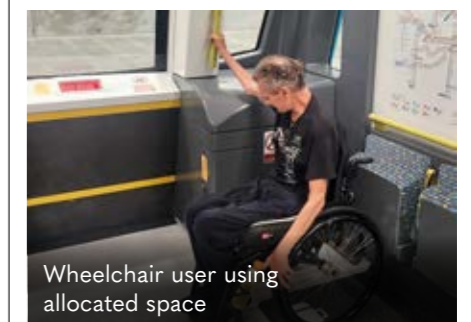
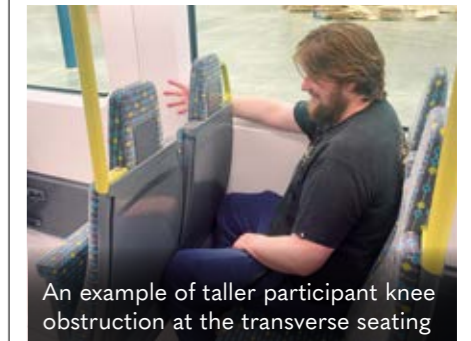
Small but meaningful design refinements, such as the form and positioning of help points, emerged only after observing users interacting naturally with the environment. These insights highlight a recurring human factors lesson: compliance doesn’t guarantee usability, and usability can’t be fully understood without observing people in context.

**Reflections for ergonomics practice**

This project reinforces the value of combining digital human modelling with physical testing to support human-centred design decisions. Virtual tools are effective for early exploration and risk identification, while physical mock-ups remain essential for understanding behaviour, perception and movement in shared spaces.

For ergonomists, the key takeaway is not the specific design outcome but the process: iterating designs through progressively realistic representations, engaging diverse users early and using evidence from human interaction to inform decisions. In complex public systems, this approach

helps bridge the gap between design intent and everyday experience – a core objective of good ergonomics and human factors practice. ■



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