Zero Incidents, Real Results: How SIMS' MEWP VR Simulator Transformed Powered Access Equipment Safety at Powergate.

Summary: Raising Safety Standards with Virtual Reality Motion-Base Simulators

In high-risk construction environments, even a momentary lapse in operator judgement can lead to serious incidents. At Mace's Powergate Data Centre construction project, the challenge of ensuring consistent operator competency, especially when using Mobile Elevating Work Platforms (MEWPs), posed a significant safety concern. To address this, Mace Group implemented a cutting-edge Virtual Reality (VR) motion-base simulator to proactively identify and close skill gaps before operators were allowed to operate MEWPs on site. This case study explores how the simulator not only eliminated MEWP incidents and reduced entrapment risks but also elevated the overall operator proficiency for powered access equipment. By mandating simulation-based assessments prior to operators working on site, Mace has set a new industry benchmark for proactive safety and risk management in complex construction projects.

Introduction: A Collaborative Approach to MEWP Safety

To address the critical challenge of MEWP safety in high-risk construction environments, Mace Group partnered with Nationwide Platforms and Serious Industrial Motion Simulators (SIMS) to develop an innovative, technology-driven solution.

Mace Group is a global company that acts as both a delivery consultant and a construction expert, specializing in delivering complex projects worldwide. They offer a wide range of services, including program and project management, cost consultancy, and construction delivery. Mace is known for its expertise in large-scale projects such as skyscrapers, data centres, and infrastructure, with a focus on innovation, sustainability, and responsible business practices.

Nationwide Platforms is a UK-based market leader in powered access equipment, including the rental and training of Mobile Elevated Work Platforms (MEWPs). They are part of the Loxam Group and have a large fleet of over 13,000 machines and a network of 31 depots across the UK.

Serious Industrial Motion Simulators (SIMS) are an award-winning Canadian technology company that develops virtual reality (VR) motion simulation training solutions for the global heavy equipment industry.

Powergate: A Hyper-Scale Data Centre

The Powergate Data Centre is a hyper-scale data centre construction project located in West London. Datacentres provide the physical infrastructure for the technology we depend on at work and in our personal lives.

The construction project involves managing a large, intricate site with delicate infrastructure like data cabling and cooling systems requiring precision and careful planning. Many of these tasks involve working at height, specifically utilising MEWPs.

IPAF: MEWP Licensing and Operator Safety

IPAF (International Powered Access Federation) is a global organization dedicated to promoting the safe and effective use of powered access equipment. IPAF certifies operators of mobile elevating work platforms (MEWPs) and issues PAL (Powered Access License) Cards that are valid for 5 years from the date of award, and during this time, operators can use their tested classification (Group A or B and Type 1, 2, or 3) of machinery without any further recurrent training or assessments beyond keeping a log book of time spent on MEWPs.

During their training and initial testing, the practical element is normally conducted on a small 10m boom lift (3B test) and an 8m scissor lift (3A test). At any point during these 5 years, an operator can use any machine within the 3A or 3B category, this can range from 10 to 53 meter boom lifts and 6 to 32 meter scissor lifts, all without any further training or testing. Additionally, there is nothing stopping an operator, as an example, who last operated a MEWP 4 years ago from being tasked with operating a MEWP on an active construction site—despite the presence of numerous and potentially serious hazards.

IPAF: MEWP Industry Trends

The main causes of incidents and accidents explored within IPAF's Global Safety Report 2024, remain consistent with past reports and covers a variety of risks, including falls from the platform, overturns, electrocution, entrapment, MEWP mechanical failure, and being hit by a vehicle or machine. These findings underscore the multifaceted nature of safety challenges in the powered access industry, necessitating targeted interventions and proactive measures to mitigate risks and enhance safety standards.

Offering an overview of their latest findings, IPAF's Global Safety Report 2024 seeks to provide a clearer picture of the powered access industry. While there was an 11.7% decrease in Fatal and Major incident reports compared to the previous year, this decline contrasts with a rise in fatalities, highlighting the persistent safety challenges the industry must collectively overcome. Notably, the construction sector emerges as the most affected, with 44.9% of incident reports originating from this industry. Analysis revealed specific trends in MEWP categories involved in incidents, with 1B platforms and 3A platforms being the most common across various incident types.

MEWP VR Simulator: Assessing Operator Skill Levels to Reduce Risks

The Mace Group partnered with Nationwide Platforms to address the growing safety concerns related to working at height throughout the project. Having supplied MEWPs to numerous complex hyper-scale data centre projects nationally, Nationwide Platforms were able to quickly ascertain that the risk of incidents predominantly lied with the competence of the operator and not the functionality of the machine.

Nationwide Platforms introduced their MEWP VR Simulator and engaged the support of SIMS to integrate the technology into the site's safety program. The MEWP VR Simulator is designed to assess operator proficiency based on how efficiently and safely they complete tasks. This is achieved by monitoring operator behaviour such as tracking where they are looking during machine operation as well as how they manage control inputs. With scenarios from beginner to advanced, it's able to assess operators and help determine risk-based work assignments—such as operating in confined spaces or near sensitive equipment—while reducing fuel use and equipment wear through a zero-emission, cost effective training and testing solution.

To maximize impact, Mace mandated that all MEWP operators achieve a 'competent' status by passing an IPAF-certified simulator assessment before working at height. It should be noted that all operators assessed on this project were certified operators with PAL cards for working at height.

This proactive measure significantly reduced the risk of incidents on site by ensuring that only competent operators were cleared to use MEWPs.

MACE: Assessment, Refresher Training, and Approval of MEWP Operators

Assessment: The initial assessment included two scenarios, '3A Practical Assessment' and '3B Practical Assessment', where operators were required to complete a series of tasks that captured all the necessary elements of a practical evaluation using live equipment. During the assessment, an operator's performance was initially assessed using SIMS' scoring system, which tracked metrics across several key areas to generate a quantitative safety score. This data was then reviewed alongside the evaluator's qualitative assessment, which considered factors such as situational awareness and decision-making under pressure. The final assessment combined both perspectives to provide a balanced and comprehensive evaluation of an operator's capabilities.

Note: at the time of assessment every operator assessed held a valid IPAF PAL card.

Refresher Training: When operators did not receive a pass on their first attempt, they were given some refresher training in the form of evaluator feedback to reinforce the safe use of MEWPs, which included a review of penalties, operator risks, and site hazards to improve their skills using the equipment. Ample time was provided for operators to ask questions and share concerns with the evaluator before attempting a reassessment.

Approval: After the refresher training was completed, the operator completed a re-assessment to embark on improving their results using the SIMS' scoring system and evaluator's assessment. If the operator did not successfully complete their re-assessment, they were provided with additional refresher training—up to a defined limit—to support their development and ensure they met the required standards for MEWP operation on site.

Key Results: MEWP VR Simulator Reduces Incidents and Boosts Operator Skills

Over the period of 15 months, a total of 1,280 operators were assessed, completing 1,552 Scissor Lift (3A) assessments and 314 Boom Lift (3B) assessments. Of these assessments, 1,216 operators were approved to use Scissor Lifts and 203 operators were approved to use Boom Lifts.

Our study found that 34% (1 in 3 operators) failed their initial 3B assessment and 21% (1 in 5 operators) failed their initial 3A assessment, indicating a significant skill gap between expected competence, given their certification, and actual delivered competence on any given day (Fig 1).

Fig 1. Percent of operators that failed their initial assessments for (A) Scissor Lifts and (B) Boom Lifts.

The effect of the refresher training provided by Mace Group using the MEWP VR Simulator allowed operators to learn in real-time where they were given individual and immediate feedback based on the data collected and reported by the simulator to help reinforce their learning.

Compared to initial assessments, operators using the Scissor Lift (3A) experienced a 50% decrease in observational errors and a 63% reduction in entrapment-related errors. Similarly, those using Boom Lift (3B) demonstrated a 59% reduction in observational errors and a 60% reduction in entrapment-related errors (Fig 2). Observational errors are instances where an operator has engaged a control that moves part or the whole machine in a direction without visually checking in that direction first. Entrapment errors are the subset of these instances where the nature of the movement could cause an entrapment. An example of this would be the operator elevating the platform without first checking above themselves.

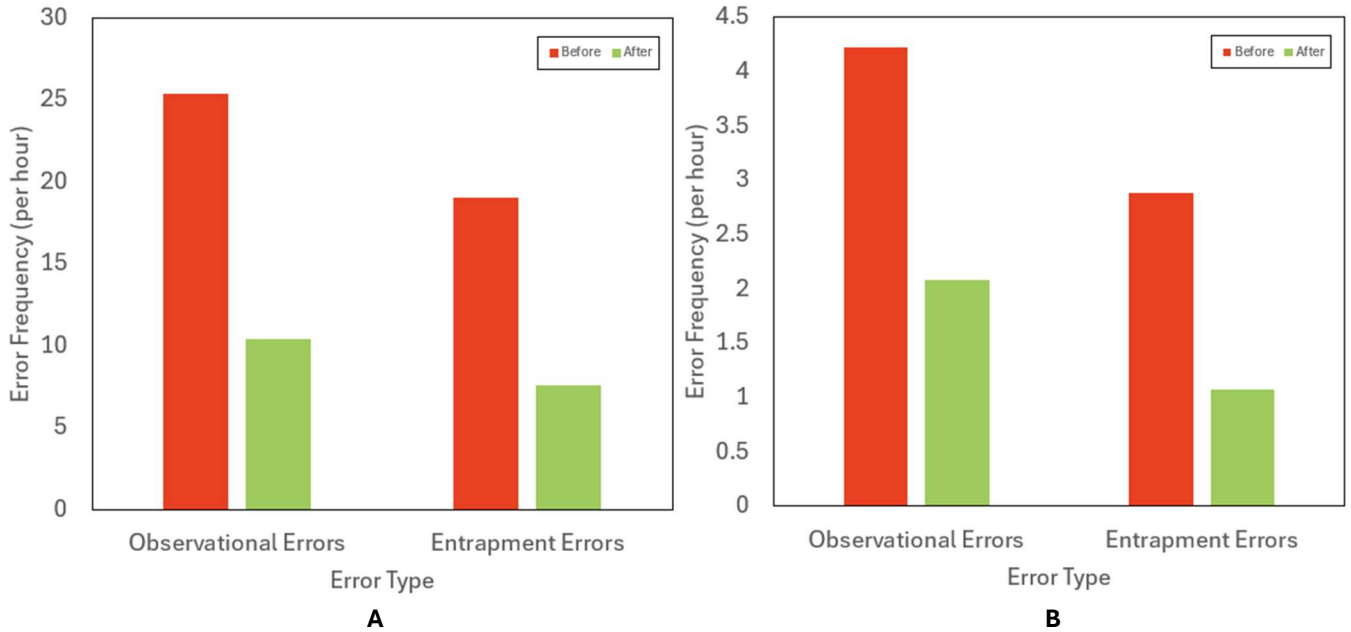

Fig 2. Reduced observational and entrapment errors before and after upskilling for (A) Scissor Lift operators and (B) Boom Lift operators.

While improved performance metrics were observed among operators who avoided collisions, a closer examination of failure cases reveals the critical impact of collision-related incidents on assessment outcomes. It is important to note that of the 21% of the operators that failed their initial 3A assessment, 88% of them failed due to a collision with an object or a structure (Fig 3). This highlights that collision-related incidents are the primary reason for failing the initial assessment, which calls to attention potential issues with spatial awareness, control of the equipment, and understanding one's surroundings or blind spots.

The use of the MEWP VR Simulator mitigates these risks by providing operators with a safe, immersive, and repeatable training environment to help develop a better sense of depth perception, equipment dimensions, and blind spots that can contribute to collisions.

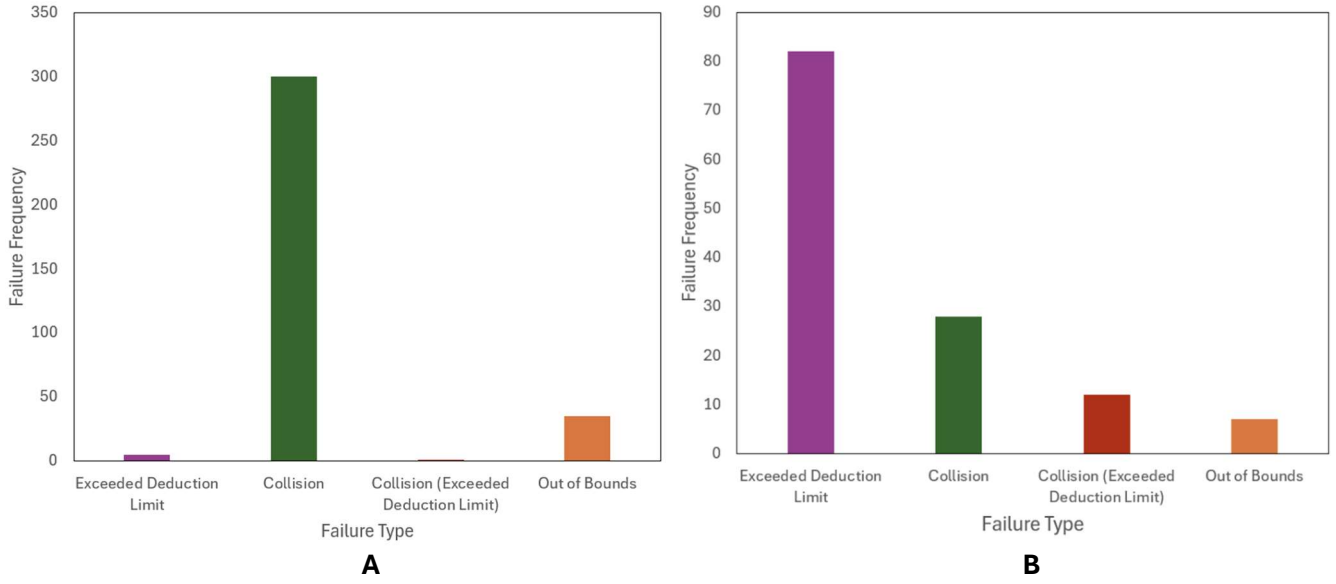

Fig 3. Frequency charts of failure types for failed assessments for both (A) Scissor Lift and (B) Boom Lift

Furthermore, the distribution of attempts required by operators to successfully pass the assessment is concerning. A significant majority—approximately 66%—passed on their first attempt, indicating that most operators were well-prepared and competent (Fig 4). However, the steep drop-off in subsequent attempts highlights that those who did not pass initially often required multiple retries, suggesting that early failures may be linked to more serious performance issues, such as collisions. This distribution pattern underscores the importance of assessing operators for skilled performance to identify those who struggle early on, and to provide additional support or practice to achieve competency.

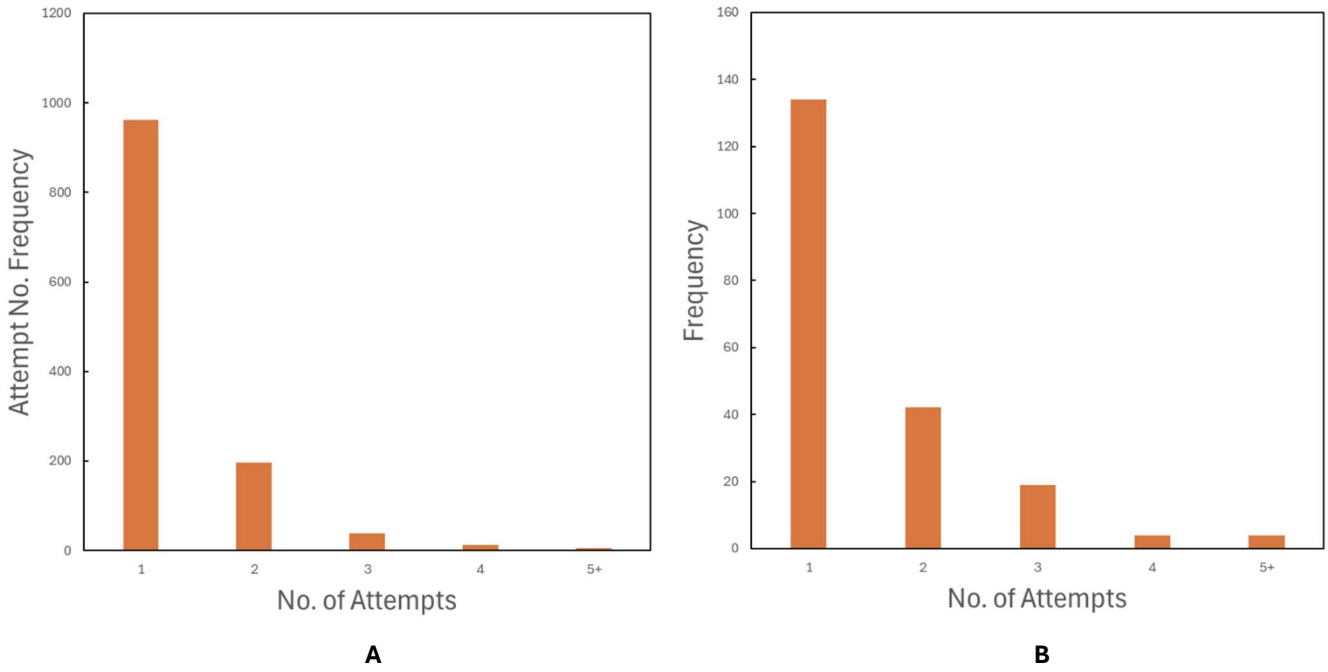

Fig 4. Frequency charts showing number of attempts taken to pass each assessment

By identifying and addressing these challenges through tools like the MEWP VR Simulator, training programs can more effectively support operator success and reduce the likelihood of failures

Result

Since implementing the MEWP VR Simulator to assess operators for skill gaps by completing initial tests, upskilling, and re-testing the result has been a **100% reduction in MEWP-related incidents on the construction site.**

Conclusion

The implementation of the MEWP VR Simulator at the Powergate Data Centre construction project has redefined safety standards in high-risk construction environments. By proactively identifying operator skill gaps and mandating simulation-based assessments, Mace has not only eliminated MEWP-related incidents but also improved overall operator proficiency. This initiative exemplifies how immersive, data-driven training can transform traditional safety practices into predictive, performance-based systems.

The success of this program underscores the critical importance of continuous competency evaluation, even among certified operators, and highlights the limitations of solely relying on static licensing systems. Through its partnership with Nationwide Platforms and SIMS, the Mace Group has set a new industry benchmark for proactive risk mitigation and workforce readiness for high-stakes construction environments.

Looking ahead, the continued integration of VR simulators across similar projects is not only recommended—it is essential. As construction projects grow in complexity and scale, so too must the tools we use to ensure safety and competency. The Powergate deployment serves as a compelling model for how innovation, when strategically applied, can lead to measurable, life-saving outcomes.