

Inspirational designs for engineering reality

DCA Design International has been creating design solutions for international railway projects for more than 40 years. In fact, every day over three million people around the world complete journeys using rail vehicles incorporating DCA's design work

With a heritage that stretches back to the revolutionary Central line rolling stock programme in 1982 and encompassing such icons as the 'Tangara' double-deck suburban trains for Sydney, Australia and the Eurotunnel 'Le Shuttle' carrying road vehicles between England and France, DCA's expertise in designing for the railway market is unparalleled.

Recent projects such as the new interiors for Northern Ireland Railways' C4K series EMUs supplied by CAF; the engineering and ergonomic design of Percy Lane's emergency detrainment system for London Underground's new S-Stock trains; and DCA's Premium Class concept for the next generation of European high-speed trains mean that the railway sector continues to be a major contributor to the DCA success story. In 2011, this story has seen DCA crowned by Design Week magazine as the UK's leading product design consultancy for the seventh year running, while the last twelve months have brought prestigious design awards from redden, the Chicago Athenaeum (Good Design Award) and the Industrial Designers Society of America (IDEA).

How has DCA maintained and built upon this level of success through the good times and the bad times for the rail industry over the last four decades? The answer is found in the company's intelligent approach to design, through which it ensures that the most appropriate tools and techniques are always brought to bear at the right time in each design project tackled. Paramount in the selection of these tools and techniques is DCA's open and transparent attitude to the identification and management of risk. The company goes to great lengths to thoroughly understand each client's unique attitude to risk and can then propose a programme of work and associated risk management strategies that align with their risk profile.

The work programme agreed with



the client will blend theoretical, practical, commercial and market-based assessments of the proposed design solutions to reduce development risks in line with the client's project-specific balance position between project risk and development investment and timescales. DCA can call upon photo-realistically rendered computer models and simulations for early assessments of the design intent; CAD-based analyses of structural strength, mechanisms, or fluid and heat flows to provide predictions of functional performance; and representative models, rigs and mock-ups for physical performance testing and practical assessment by passenger groups, drivers and operating staff and other key stakeholders such as the relevant Notified

Bodies (NOBOs) and advisory groups on inclusive design.

This is only possible because DCA offers a truly integrated design and development service to its railway clients, which means all the services needed to address development risk are available under one roof. Project teams are drawn from an in-house pool of over 110 talented employees. This pool includes specialists in strategy and research, user interaction and ergonomics, design, mechanical engineering, hardware and software development, prototyping and model-making. At its offices in the heart of England, DCA can provide all the skills and resources needed to turn ideas into practical designs and transform concepts into fully

detailed, working solutions.

DCA overlays this dynamic, integrated way of working with rigorous development processes. Their proven, staged approach to transportation design combines all the in-house disciplines to put the people who are directly touched by rail services – whether as providers or users – at the heart of their work. DCA's ISO 9001-2008 approved systems guarantee the quality of its design processes and project management procedures. So, the company's clients can be confident of receiving the highest quality results, every time, whatever their needs.

Informed decision-making is the backbone of every project undertaken. In every area of the design work and at every stage of a project, DCA is looking for opportunities to validate its output. Qualitative research is one way by which the company aims to gather evidence to support design decisions and its research specialists employ a variety of tools and techniques at the beginning of a project to study and understand what people really value in their journey experiences, what works well and what frustrates them.

This initial qualitative research aims to answer questions such as: How can a single vehicle space cater for the needs of a parent struggling with three small children whilst providing a productive work environment for the busy executive? How can a transport system cope with the radically different usage patterns that it sees throughout the day? By addressing such 'big-picture' issues as these as well as identifying more detailed opportunities for improvement, the initial research activities invariably lead to insights and provide clarity and direction for the design team. The resulting observations allow DCA to move beyond the traditional design specification based purely on functional requirements and passenger seating capacity to a more holistic brief that responds to both the spoken and unspoken needs of those who will interact with the rail vehicles and the service they will provide on a daily basis.

Research also creates a wealth of reference material against which potential solutions can be benchmarked. Moreover, DCA always aims to revisit its focus groups at regular intervals throughout the project, testing the emerging ideas and ensuring a correct interpretation of the users' desires as they were stated during the earlier research.

DCA's designers use these insights as



Toilet facility for Northern Ireland Railways C4K series EMUs



the basis for their creative work, generating concepts that respond to passenger desires. They work hand-in-hand with the human factors team who combine theoretical tools and anthropometric data with practical techniques to make the human element a central part of the design process. They ensure that not only are PRM/TSI regulations met, but that both passenger and crew areas are comfortable and people-friendly.

At their heart, transportation projects are about people and nowhere are ergonomic demands more challenging or more diverse. They range from the macro-ergonomic issues of passenger flow and dwell time reduction to the detailed interaction of passengers of all ages and physical abilities with individual touch

points within the vehicles. Crucially they must also address the most demanding of potential emergency situations. DCA's designs must provide comfort and convenience in normal operation, and safety and reassurance at moments of crisis. They must also cater for special needs groups, and help operating staff to deliver the excellent levels of service that will nurture customer loyalty.

As well as being functional and ergonomic, vehicle designs should strive to be inspirational, exciting and iconic. Successful transport systems have to capture the public imagination as well as meeting passengers' true needs. DCA's designers have a deep understanding of visual identity and a strong appreciation of brand values, honed through working on many of the world's leading FMCG and consumer brands. The company has even developed its own bespoke methodology for capturing Visual Brand Language in a form that is tangible and accessible to designers and marketing and branding professionals alike. This depth of understanding ensures that DCA's rail designs convey the appropriate manufacturer and the operator brand messages.

Visionary brand-led design concepts can only be realised through engineering excellence. It is all too common for inspirational design proposals to be diluted and their rationale lost when they are thrown over the wall to a separated engineering team for translation into a manufacturable reality. With DCA's integrated design and engineering approach this is simply not an option. The company employs technical and

Rolling Stock

design innovation in parallel to align form and function perfectly and deliver design solutions into production without compromises. To this end, DCA's engineers are constantly extending their knowledge of processes, materials and technologies in order to realise the design goals within the rail industry's demanding legislative, safety and commercial constraints.

Whether carrying out Finite Element Analysis to predict the load-bearing capacity of an armrest or emergency egress step, or liaising with suppliers to establish the limitations of a production process, DCA's engineers work side-by-side with the design team to ensure that any proposed design vision, even at the earliest stages of a project, will be functional, durable and cost-effective when implemented. Close collaboration with OEM suppliers and vehicle manufacturing and assembly teams provides the basis for a smooth transfer into production and leads to longevity and reliability in service.

There is no shortage of choice for manufacturers or operators looking for a design company to support their next new



Premium Class concept for the next generation of European high-speed trains

design or refit programme. However, DCA believes that it has developed a unique approach to designing for the rail market. It is an approach that produces highly innovative and creative design solutions in response to the full breadth of genuine user requirements and corporate branding aspirations. Crucially though, DCA's solutions remain practical and grounded in engineering reality so that

they can be delivered in real rail vehicles that accurately embody the original design intent as they enter service and throughout their operational life. ■

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