CAB DESIGN IN THE 800 SERIES

DCA Design International's Research Lead, Dan Jenkins, gave a presentation on the development of the Hitachi Class 800/801 trains - the new InterCity Express Programme trains being produced for the East Coast and Great Western routes - to the Chartered Institute of Ergonomics and Human Factors (CIEHF) at their annual conference in April 2015. The presentation focused on the importance of the integration of human factors into the design and development process, and the consideration of inclusive design in rail vehicle interior design.

A seven step process was discussed that explains how requirements were gathered and refined, and the role of mock-ups and prototypes at differing levels of fidelity. Two new methods were also discussed, one for assessing glare within cabs and one for assessing the cab and desk layout against known tasks.

All relevant standards and guidelines for the train cab were reviewed, and additional requirements developed based on analysis of the train user population. A desk based assessment of initial train design used 2D drawings and 3D CAD models.

The cab control layout was dominated by a number of core philosophies, the key one being that all pertinent information and controls are presented in the primary zone in front of the driver.

With the user required to operate the combined power brake controller with their left hand, controls that require actuation are biased to the right, whereas display only features - such as CCTV screen and indicator lamps - have been placed to the left. The final philosophy is to cluster controls by function, for example, all engine controls together in one place.

Consistent conventions are also followed, such as 'up' above 'down', not next to it or below it, and 'start' always above 'stop' – which may seem basic rules but which DCA notes are often not

Class 800 series cab interior mock up. HITACHI

followed on other trains. Basic 2D drawings of cab control layouts were sent out for comments. Then a simple scale model was created on foamboard, on which controls could be repositioned in response to drivers' comments, with engineers also on hand to explain what was technically feasible behind the real panels. A wide range of stakeholders were involved in group discussions using these layouts. DCA says much of the debate came from the two train operating companies for East Coast and Great Western, with

different expectations based on legacy vehicles and existing on-board task distributions.

This approach helped to ensure that each stakeholder had a voice, and understood why the final configuration was the way it was, says DCA, while initial concerns could be allayed by asking drivers to play out common tasks, helping towards consensus.

A spatially accurate mock-up was then created, mounted at rail height to allow consideration of access, driver postures, and external visibility.

After a few iterations of the wooden mock up, a full mock-up was built, using production seats and switchgear. Each of the 87 cab controls was assessed in turn for visibility, reach, suitability and risk of inadvertent operation.

A hierarchical task analysis was developed based on training materials and discussions with drivers, to cover start up, routine driving tasks, communications and emergencies. Although building the task model was relatively time consuming, DCA says it proved to be a very efficient way of assessing the cab and ensuring a suitable range of tasks had been considered, and the task based assessments gave some insights that did not emerge from the static assessment.

To improve on methods of assessing external visibility using drawings, a glare assessment technique was developed, with windows blacked out to assess any glare from internal lights and displays. For external glare, a very bright light was repositioned to represent a range of external light sources, including windscreen and side windows. Sunblind, recessing and cowling changes were then considered. ◼