Training, Modelling and Simulation

Manchester-based EDM is a specialist in training and simulation, supporting airlines with door and cabin training systems. **Paul E Eden** visited the factory for *Airliner World*, experiencing the latest CEET/SEPTRE cabin emergency evacuation trainer.

Long ago, when computer-aided design was but a twinkle in software developers' eyes, design teams, investors and customers relied heavily on scale models to visualise the latest innovations in aircraft and equipment. These were supplied by firms such as EDM, which was established in Manchester in 1971 to create models for demonstration and proving purposes. The path from models to the company's current range of advanced training and simulation products was surprisingly short.

Still in Manchester, but occupying a new 100,000sq ft (9,290m²) high-tech building, EDM remains privately owned and forecasts a £15.5 million turnover for 2015, while plans are in hand to expand factory space by 50%. Its 150-strong staff produces an eclectic mix of products for the UK and export markets, manufacturing many components on site and assembling complete products ready for delivery.

Much of EDM's work remains faithful to its model-making roots. Its perfect-replica Martin-Baker ejection seats, for example, have all the solidity and weight of the real thing, but are not built to airworthy standards or with functioning ejection systems, making them a far cheaper option for technicians to learn on.

When *Airliner World* toured the factory with sales executive Lee Whittaker, one corner of the facility was occupied by chunks of airliner fuselage. The walk towards them took us past half a Eurofighter Typhoon forward fuselage lying incongruously on the floor. "It's part of one of our cockpit access trainers," Whittaker explained. It felt like Airfix on a real-world scale. »

EDM's Manchester facility. ALL PHOTOS EDM

INSET • ***Ethiopian Airlines' Boeing 737/757 CEET/SEPTRE includes evacuation slides.***

Open Doors

He led the way to the fuselage sections and it quickly became clear they were door trainers, each complete with a perfect section of cabin wall and fully functioning door. Some included one or two rows of seats, a toilet cubicle or other equipment according to individual cabin layout and customer requirements. Each was equipped to familiarise cabin crew with the operation of a particular door and to simulate faults in its operation.

Built using manufacturer's drawings, a range of door trainers is available which cover different aircraft types and, thanks to their modular design, are easily customisable to match individual airline requirements. They can also be upgraded to match changes in operational fleets.

TOP • ***EDM's factory floor is divided into areas by product, and then into individual workstations. A building programme will increase capacity by 50%.***

ABOVE • ***Thanks to its skilled workforce, EDM manufactures many system components on-site.***

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All the capabilities to build equipment from scratch are available in the factory, but some customers have chosen to supply sections from old airframes for the basis of EDM's work.

The firm also offers extended door trainers, which feature both a main door and overwing exits. Seats and overhead bins are installed as standard. Customers can choose to mount any of the company's door trainers at operational height, including a training slide for more realistic emergency drills.

Where space is limited, EDM offers a projection system that deploys a 'virtual slide', so that trainees see what happens when a slide is extended, even though the equipment is absent.

By the end of 2015, EDM had supplied an Airbus A350 door t rainer to Cathay Pacific; an A350 door trainer to Singapore Airlines; a Boeing 737NG door and overwing exit trainers to Turkish Airlines; and Boeing 737/757 and 777/787 Cabin Emergency Evacuation Trainers (CEETs) plus 767 and Bombardier Dash 8-Q400 door trainers to »

Door Trainers

Learning how to operate an airliner's doors safely is an essential, flight-critical skill for trainee cabin crew and those switching to a new aircraft type – there can be considerable differences between door closure methods and even in the way a door is hinged. Try one of EDM's Boeing 737 door trainers and the weight of the aircraft's main doors will probably come as a surprise. Considerable practice is required just to operate the door normally and this is far more cost-effectively accomplished in a teaching environment than on a live aircraft.

For normal and emergency operation, EDM's door trainers include standard and malfunction features. In the case of the 737 these include normal opening/closing, door arming/disarming, emergency operation and emergency lights, while simulated failures include handle jam, door jam, auto-slide deployment failure and manual slide deployment failure.

Combining a main door trainer with an overwing exit creates an extended door trainer – and where customers choose to mount these at operational height (matching the floor height of the training device to that of the actual aircraft floor) they are available with slides, wing ramps and support structures. Such flexibility is possible thanks to EDM's modular design philosophy, which also enables easy transportation between sites and simplifies the installation of door trainers into CEETs. Alongside its 737 door trainer, EDM offers devices covering the 747, 757, 777 and 787. Its Airbus range includes the A320 Family, A330/340, A350 and A380. Other door types in the company's catalogue include those of the ATR 42/72, Bombardier Dash 8-Q400, COMAC C919 and Sukhoi Superjet. It also has products suitable for business jets from Cessna, Dassault, Hawker and Gulfstream.

Mounting a CEET on a moveable platform adds considerably to training realism. The attitude of this XiamenAir system might be simulating a starboard main under-carriage failure.

Ethiopian Airlines.

It had also taken several orders, including a major deal with existing customer Cathay Pacific. Spanning EDM's product range, the Cathay contract includes A330 and 777 CEETs and door trainers as well as upper-deck crew service door and main-deck door trainers for the 747 freighter.

CEET and SEPTRE

In a further extension of its emergency training devices, the company builds the modular Cabin Emergency Evacuation Trainer system to airline requirements. Facilitating whole-cabin simulation of emergencies and including main door and overwing door trainers as required, the CEET is also equipped for cabin familiarisation training, with in-flight entertainment systems, lighting, public address and other equipment. Customers mount their CEETs at floor level, on static platforms or on motion-based devices, the latter moving the entire system to simulate flight – or crash-landing – conditions.

Significantly for the CEET line, in November 2015 EDM completed installation of a hybrid 737/757 system for Ethiopian Airlines. Equipped with the Safety and Emergency Procedure Training Reality Engine (SEPTRE), it was scheduled to be joined by a 777/787 trainer at the end of the year. The 737/757 unit is installed on an electric motion platform, while the 777/787 platform is fixed.

Prior to the Ethiopian CEET/SEPTRE order, the system had been the preserve of Chinese airlines – where regulations call for a 0.5g 'heave' for cabin evacuation training, requiring a simulator capable of tilting.

In a move typical of the company's innovative approach, EDM included SEPTRE in its range for delivery from 2012, adding visuals to complete the impression of 'flying' – or, indeed, crashing – that the motion platform brings. Combined with a CEET, SEPTRE delivers high-resolution imagery at each cabin window, completing the training experience in a system that's more simulator than simple trainer.

For non-Chinese carriers the moving platform and SEPTRE options offer a new level in training realism, but their particular capabilities are not required for regulatory approval. Whittaker remains confident that more major airline customers will emerge, however, once the training benefits are seen to outweigh the cost of the additional capability.

Less dramatic in use than the CEET, but equally important for cabin crew training, EDM also offers cabin service trainers. Again produced to exactly represent operational cabins, they include First Class, Business or Economy seating along with overhead stowage, cabin crew call lights, cabin lighting and control systems, and functional interphone. A fully operational galley is included for safe, efficient food and beverage preparation and distribution procedures.

For the most part, EDM's products are invisible to the travelling public, although they play a critical role in assuring safety. Ironically, its most obvious creations are familiar to thousands, perhaps millions, of trade exhibition and airshow attendees. Reaching right back to its modelling origins, EDM's bespoke full-scale aircraft mock-ups depict the BAE Systems Mantis and Eurofighter Typhoon among other military aircraft, as well as various future airliner cabins, providing visitors with a glance at the travel possibilities of the future. AW

ABOVE • ***This Air China CEET is equipped with the SEPTRE system, visible externally as the 'boxes' over the cabin and door windows.***

BOTTOM LEFT • ***The seats in Ethiopian's 737/757 CEET/SEPTRE are upholstered in suitably patriotic colours.***

BOTTOM RIGHT • ***Lee Whittaker in the instructor's position, ready to demonstrate the CEET/SEPTRE system.***

COMAC's C919 cabin mock-up is another of EDM's creations.

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SEPTRE Spectacle

Airliner World experienced Ethiopian Airlines' SEPTRE-equipped 737/757 CEET before its delivery to Addis Ababa. The carrier employs the system on a motion platform, but headroom in EDM's factory prevented a moving installation for the demonstration.

Using a retired 737 fuselage as its basis, the CEET was mounted at operational height and remained impressive, even on a static platform. The confines of the factory also prevented the smoke generation system being used. It exhausts through a vent in the rear fuselage and would have caused havoc with the facility's fire detection system.

The starboard rear main door is to 757 standard, requiring a 'blister' to fair it into the fuselage, but the cabin is all 737. Every CEET includes an instructor's position from which simulations are run, students are monitored and unexpected events generated to test them.

Lee Whittaker takes the instructor's seat and runs through the selection of pre-programmed scenarios: normal flight, ditching, decompression, left main gear collapse and engine fire – aborted take-off is also available.

The CEET incorporates an impressive audio system as standard and the sound of panicking passengers mixed with those of whatever trauma is afflicting the 'aircraft' produces an impressive, powerful auditory experience. In the ditching simulation, for example, the passengers become increasingly agitated as water comes unerringly closer outside the window – the crash of impact temporarily overwhelming their noise as it cascades over the wing and aft fuselage. With the wings settling onto the water, the screaming and panic resume, pierced by the sound of a baby crying. The subsequent engine fire feels real enough to have us checking nervously out of the windows, while the explosive decompression, signalled by a bang deep enough to feel, results in oxygen masks dropping from overhead.

The CEET/SEPTRE system elevates training to a heightened level, even with features such as smoke and movement lacking. Were the former available, Whittaker explains, we might also have experienced a cabin fire, thanks to a flashing red light source in one of the storage bins. Such is the realism that trainees 'fight' it with special extinguishers until it goes out. Should they do an incomplete job, it 'smoulders' for a while before flaring up again.

Representatives from Ethiopian visited Manchester in July 2015 for 737/757 CEET/SEPTRE factory acceptance testing.