FIRST AMONG EQUALS

The Protos is unusual due to its fast prototyping stages. It's almost as if the first production model leapt straight off the screen, as Jon Lawson **finds out**

THE DEVELOPMENT STORY of the Protos railcar started in early 2005, when German train builder Fahrzeugtechnik Dessau got in touch with Berlin-based IFS Design.

The brief for IFS was ambitious: As well as designing the exterior, a stylish and flexible interior had to be created all within a strict timeframe. IFS designer Andreas Bell explains: "The theory behind the brief was that the train should be able to fulfil many different customer's requirements. With this in mind, everything had to be modular, both inside and out." Above the flat-floor foundation, everything is split into easily removable sections, even the roof modules.

The IFS designers start their projects in the traditional way, with a good idea and a blank sheet of paper. "It's always best to begin by doing these things by hand. Then, as soon as an idea is born, we get it into 2D and 3D computer design tools and the collaborative process can begin. Usability, functionality and formal quality are as essential as materials, colours, lighting and atmosphere. All together they take on shape in parallel," confirms Bell.

At this early stage, IFS sent its initial creations over to the manufacturer for comments. FTD Dessau was involved in every step of the design process, a philosophy that reduces the risk of manufacturing difficulties in the crucial last stages.

Next came the 3D models prepared by IFS and its supplying companies (for example, the entire interior decoration system was developed and manufactured by Bernhard Wissmann GmbH, of Schermbeck, Germany). Once the information was ready, it was sent to FTD Dessau, which by this stage was starting to consider production practicalities like the shape of press tools and how the panels would be fitted together.

Bell notes: "It all happened in parallel. We had great communication between design and engineering. They explained to us the hard engineering facts and we learned to accept them and work with them, but they listened very carefully to us about the design side. This was a very positive experience for us, definitely creating a progressive work environment for everyone involved."

The 3D models enabled the designers to render and animate the future design in a photorealistic and lively way for a better evaluation of design decisions, and for a more detailed liaison with the customer and the suppliers.

Due to modern design and engineering tools, a virtual process of stress analysis, finite element testing, quality control and structural and weight evaluation took place in Dessau. Together with the Technical University of Berlin, the crash worthiness of the Protos was assured before anything was physically built.

"As a result of those complex testing methods, necessary design alterations were then conducted by IFS in order to keep the overall product quality consistent," adds Bell.

Unusually for a project of this size, no complete interior mock-ups were created. Due to the compressed timescale (18 months for both design and engineering), there was only scope to construct partial mock-ups, to create, for example, the driver's space for ergonomics checks.

Both companies have taken the view that the first 1:1 scale prototype is actually the finished train itself – a risky philosophy but one Bell was confident about: "The standards of design and engineering software nowadays are so well developed, it allowed us to get very close to real prototypes on screen. Yet for many different partial sections, in particular the interior, we evaluated our design solutions with 1:1 scale settings to proof crucial ergonomic factors before freezing the design. The Bernhard Wissmann GmbH-delivered 1:1 scale real material models of each

This spacious area is just one option available with the flexible interior

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On show for the first time, the Protos was well received. The first units will go into service next year

Making it

DR WERNER MARX, PROJECT MANAGER OF THE PROTOS AT FAHRZEUGTECHNIK DESSAU, WAS RESPONSIBLE FOR MUCH OF THE ENGINEERING. He told Railway Interiors: "We are very pleased with the end product. The option of extending the train from two to eight wagons by simply adding middle wagons to the end wagons gives great flexibility. Each middle wagon has its own driving axles, so the train can be extended without loss of driving performance. Also, the choice of motive power, EMU or DMU, offers great flexibility. So we can have, say, a current collector for the Netherlands market, or transformers for the German overhead wire system, or we could add power packs and cooling units, giving a free choice of driving system. To be able to offer a change of drive, even within the life-cycle, creates a very attractive package." Marx believes that by offering so many options on the one platform, customers with varying requirements can be accommodated. He continues: "Take the floor. We are even able to adapt the height to different platforms." Marx's biggest challenge now lies ahead. "The most difficult part of the project will be to get enough customers... as we are not a big company, we are not able to produce concepts for every client. So it is necessary for us to stay with the flexible concept. After the homologation process, we intend to stick with the design and see what happens when we talk to the operators."

The luggage racks were carefully designed to reduce weight

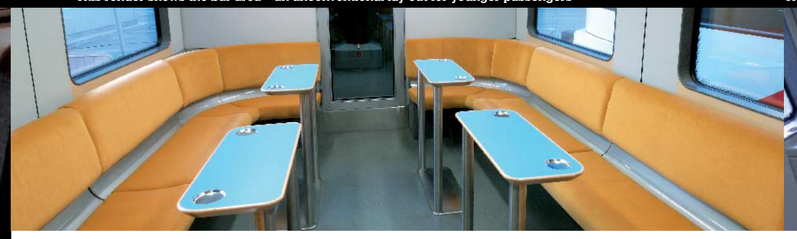
individual segment of the interior decoration helped both the designers and engineers to understand how design decisions will finally turn out – an essential approach during the development of a new product."

Everything inside was designed to be modular. Between each seam, from the ceiling panels all the way to the lighting fixtures, the entire compartment can be removed and replaced with something different.

This was not intended to be a job that an individual customer would necessarily do at a workshop, but more a case of something that would be done at the Dessau factory to offer a fast turnaround if requests come for different seat options, bar areas, play areas and interior lay-outs. The philosophy extends to the space frame and through the roof construction.

Looking to future designs, IFS is watching the market of public transportation devices and supplied products closely. "Our interest goes beyond the overall shape of vehicles and their interiors. Developing visionary mobility concepts together with our customers is engrained within our company's philosophy.

This render shows the bar area – an unconventional lay out for younger passengers



The central driver's cab was one of the few parts to have a full mock-up

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"The interior design of the Lounge and Disco areas on the Protos are just two examples of turning our customer's intention into an unconventional layout scheme for younger passengers. Material development as a creative driving force enables us to rethink common design concepts. We also like to appeal to the suppliers by simply suggesting product ideas that aren't on the market yet, but would provide a better solution for the passengers as well as operators in the future."

Speaking of materials, Bell explains: "Take the Protos window panels. Together with the B. Wissmann company, we agreed on using Corian for the frames, which is almost like an artificial stone. It has turned out to be quite a nice material, because it satisfies the relevant fire requirements and it makes the interior a bit more like being in a house."

Non-burning foams are also likely to be used more often. Several of Protos' interior panels use this material, and greater reliance is also expected on honeycomb construction. "All of these materials," notes Bell, "have one thing in common – they are all flat. This means thought is required to create a complex structure, turning 2D into 3D."

On the technology side, IFS is cognisant of customer's wishes. Bell himself travels around Berlin by train, enabling him to gain an insight into what the next trend could be and what the passengers needs truly are. He continues: "People now want wireless hotspots for their laptops. They also expect power outlets near the seats, so we have to get as close as possible to component suppliers to understand what can and cannot be done."

After the train has been in service for a year or so, the IFS design team will be back to inspect it and get some feedback from the operator. Bell adds: "Then, and only then, will we know if we have had a design success." END