

# Trip of a lifetime

A new generation of double-deck trains is to dominate Switzerland's railways for the best part of this century

In May 2010, Bombardier won the CHF1.9 billion (£1.4 billion) contract to design and build 436 vehicles, with more than 36,000 seats, for Swiss Federal Railways (SBB). The order, the largest single rolling stock contract SBB has ever placed, is for 59 double-deck train sets, made up of 20 inter-city and 30 inter-regional sets, both 200m long, and nine 100m-long interregional sets. It also secured contractual options for more than 100 extra.

The trains will be rolled out starting in December 2013. Stephane Wettstein, Bombardier's chief representative in Switzerland, points out that the last train delivered in 2019 should be in operation until 2049, and if the options are taken, the last delivered in 2029 will see service until 2059, maybe even – with an in-life overhaul – until 2069. "This project spans roughly two and half human generations. If you are a baby when this project starts, you will be a grandfather when it finishes," he says.

The significance of this is more than one of historical legacy. It means that while the trains are being designed with the best available current technology, they also have to be made able to adapt to, and adopt, any future developments introduced in the forthcoming decades.

Having said that, it is not anticipated that there will be any radical changes to the train interiors, other than possibly to cater for new communication technology and onboard entertainment and information systems.

In fact, the new trains draw design inspiration from the operator's current inter-city double-deck IC 2000s. "If you compare the new train, its not completely different," says Christian Frisch, head of SBB's domestic long-distance fleet. "It's propulsive with no locomotion, but otherwise it's quite close to what we had, we are moving in the same area we positioned the other train. The last train was meant to be the best, so it was the basis for the new train."

◆ PASSENGER RESEARCH

SBB's customer research in drawing up the specifications of the new trains was extensive. The operator's experience is that its passengers prefer wider single-deck trains, but given capacity demands this was not an option. On double-deckers, research indicated that travellers prefer the upper deck, except for some older passengers for whom stairs can present a problem.

The trains also had to cater for a very wide range of passengers. "From Monday to Friday we have morning and evening commuters working in Zurich or Berne, on weekends it's people making different journeys and we also have tourists travelling from city to city or to the airport," says Frisch.

SBB built a full-scale, two-and-half carriage model of the train to test customer reactions. This input fed through into extremely detailed specifications on dimensions of storage, seating and even the proportions of colours used in the overall palette.

At Bombardier, research was informed by its own experience of train production and operation in Switzerland, as well as its ECO4 initiative, which emphasises energy, efficiency, ecology and economy. This, for example, drove development of a new heating, lighting and air conditioning (HVAC) system, designed to reduce energy consumption while optimising the climate for passengers.

No radically new materials will be used in the train interior, but the ECO4 project is informing the material selection process. "At the end of the day we have to use materials that do not give us an issue with recycling and we have to consider what we do after the 30 or 40 years of operation. We have to focus on that because it's part of the lifecycle cost," says Wettstein.



ABOVE: The customer information system will be included on all the trains



LEFT: Luggage racks can be compact because there will be ample storage space beneath seats

BELOW: A storage area on the lower deck for large items such as bikes and skis

Capacity drive

The overriding driver for change was the pressure to increase capacity. SBB expects to increase the number of seats it provides each day by 40% between now and 2030, which will mean 120,000 more seats on its long-distance services.

"The main focus in designing the train was to optimise the number of seats so that we are able to transport as many passengers as possible," says Wettstein.

One of the main reasons Bombardier's tender won was because it offered the widest interiors with the largest number of seats, with the distances between the seats equal to the current IC 2000 coaches. Projected energy savings and its quoted price (apparently the lowest overall in terms of procurement and lifecycle costs) helped to seal the deal.

The new trains differ from the IC 2000s in that they have no locomotive and the carriages have to accommodate the drive technology. Despite this, the designers succeeded in their aim of increasing capacity. The inter-regional 200, an eight-car train, provides 696 seats, which is 26 above the specification; the inter-city 200 provides 621 against the 580 specification; and on the inter-regional four-carriage version, where the requirement was for 300 seats, Bombardier is offering 340.

This was achieved through married pairs – making two carriages electrically one unit to save space – and by a determination to maximise passenger space. "We had a concept that the



space in the carriages is there for the passengers and not for the technical equipment," says Wettstein.

Passenger amenities

To this end, the inter-city trains include a large restaurant and spacious family area; standard toilets feature at least one baby-changing table per train; there are disabled toilets; power sockets and wireless internet are available in both first and second class; and a business compartment is available on all trains for private meetings. All trains also have a customer information system, which includes a GPS map of the journey, train position, information on connections and on-train services.

Bombardier's experience and research indicated less interest among Swiss passengers for extensive onboard entertainment than in Germany, which the design partly compensates for by the large window spaces. There are also electronic seat reservation

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displays and all rolling stock is fitted with video surveillance equipment and an alarm system. The new carriages are also pressure-resistant to avoid passenger discomfort in tunnels or when passing other trains. Between the entrance platform and the door into the lower-deck cabin there is a multipurpose zone for the storage of bicycles, prams, skis and so on. All doors are equally spaced, with the aim of enabling passengers to get on and off the train in the shortest possible time.

Apart from the restaurant car on the upper deck of the inter-city train, with the kitchen on the lower deck, Bombardier is in discussions with SBB on the additional provision of a bistro service. The supply of refreshments to travellers dictated an important part of the internal design of the train. Passengers transfer between carriages on the upper deck, a feature that Bombardier believes is not found anywhere else worldwide.

"The reason for this is simply that the client wants to serve its passengers meals and drinks from a trolley service, which is on the upper deck and stays on the upper deck, otherwise you will always have stairs in between and that will never work," explains Wettstein.

Configuration

In 80% of the train the seats are in a popular face-to-face configuration. In second class, the seating configuration is 2-2, and in first class it is 2-1. The seats are cantilever-mounted against the wall for ease of floor cleaning. This also allows luggage to be stowed under the seats – the overhead luggage racks provide room for little more than a coat and umbrella.





LEFT: First class features red on a grey base

BELOW: In second class, blue is used as the accent colour



## “We did a lot of studying to improve the time taken to clean the train because this reduces lifecycle costs”

“Another design element is that you are able to fold up the table and also all the waste containers to make it easier to clean,” says Wettstein. “We did a lot of studying to improve the time taken to clean the train because this reduces lifecycle costs – energy consumption and maintainability. We have put a heavy emphasis onto having a train with high maintainability, easy access, easy cleaning and easy changing.”

The train has also been designed so that the luggage rack areas are visible from most seats for security and to deter theft. Glass is used in the racking to enhance that visibility.

The parties are currently discussing seating materials, and appear to be leaning towards textiles rather than leather. “It’s a question of cleaning, but also of temperature, because sometimes when you start to operate the trains in the morning you have to heat the whole train and leather is a little bit colder,” says Wettstein.

The colour scheme will be a grey base with black squares and red headrests in first class, and blue squares and blue headrests in second. The tables will use a high-pressure wood laminate.

### Production

Car body shell production and the first five test trains will be manufactured in Gorlitz, Germany, and the bogies will be produced at Siegen, Germany. But much of the remainder of the work will be

done at Zurich and Villeneuve in Switzerland and it is projected that approximately 60% of the train will be locally sourced. “We are in the process of finalising contracts with suppliers and we are confident we will achieve that,” says Wettstein.

The concept design was finalised in January 2011. “We are now in the pre-design phase, which will end mid-July 2011, then we start the detailed design and the car body manufacturing,” says Wettstein. “The first trains or test rides will be in the middle of 2012, then we start an 18-month test of all the different parts and train types.”

The idea is to have an acceptance process across three countries – SBB specified that the new trains should also be prepared for possible use in Germany and Austria.

The design of these new trains goes back quite some way, with a Bombardier team looking at the concepts as long ago as 2008, a year and a half before the tender was even announced. This is reassuring, given that these trains should still be serving SBB’s network well into the second half of the century. ☒