

The Aesthetic of Superlight Design

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Keywords

Aesthetic, Industrial Design, Interior Design, Metrorapid, Transrapid TR08

Abstract

The interior design of a magnetic levitation train has to meet exceptional technical requirements. On the other hand, it has to provide a fascinating and satisfying passenger experience. The development of two very different solutions will be explained: the interiors of the Transrapid TR08 as an example for a long distance application and the interior concepts for the Airport Express Munich and the Metrorapid in Nordrhein-Westfalen as an example for a more metropolitan solution.

1. Design History

In 1997 the Deutsche Bahn decides to invite four international design agencies to a competition for the interior design of the Transrapid TR08. The TR08 is planned to be the final prototype for the, at that time, up-to-date medium distance line between Hamburg and Berlin. They invite Studio de Lucchi, which has just developed that beautiful Reisezentrum-concept, they invite the office of von Gerkan, Marg + Partners, which has just designed the Metropolitan Express, they also invite Neumeister Design, which has just designed both the ICE 3 and the ICE-T. And they invite us, NOSE Applied Intelligence from Switzerland. After a series of presentations, the executive committee of the Deutsche Bahn decides on our proposal.

I like to think that we won the competition because we promised to offer the easiest way to the most advanced design. Or to be precise, by selecting a more visual approach without challenging the technical realities.

1.1 Design Briefing



At that time, the new ICE generation, designed by Neumeister Design, is just being introduced to the public. The ICE 3 and ICE –T are the epitome of the contemporary long-distance railway design. The Interior looks clean and restrained, a very bright off-white dominates walls and ceiling and the transverse walls feature a very natural looking wood veneer. The overhead racks are etched glass, thus catching some light from the indirect lighting. The first class seats are covered with dark leather. So the overall impression is that of a high class, business-oriented environment.

Now for the design of the Transrapid, Deutsche Bahn is looking for a projection of the established ICE design language into the future. The dominating themes are high-tech and high touch. The advanced technological state of the Transrapid is supposed to find its corresponding expression in the interior. At the same time an atmosphere of high quality has to be achieved through the use of noble and genuine materials.



The industry has completely different problems. For example overweight. The overall weight has been decided on a long time ago. So the more design we put into the car, the less people are allowed to take a ride. It is as simple as that. And then fire. The interior has to meet very high fire resistance specifications.

So let us compare an airplane, a maglev train and a classic train out from a designer's perspective. Classic railway coaches are able to carry high loads, travel in both directions, which is very important for the seats, and if some fire brakes out, passengers are supposed to stop the train and jump out. Passengers would find it quite difficult to remove the seat upholstery, if they would be inclined to take home a souvenir.

In an airplane, the situation is quite different. Airplanes fight daily with overweight, they travel normally only in one direction and despite the fact, that it is actually quite easy to remove the upholstery by hand, passengers cannot take home any souvenirs, since the crew keeps a watchful eye on the behavior of the passengers.

A maglev train lies some where in the middle. The interior has to be extremely lightweight, yet it may have to withstand some abuse from unfriendly passengers. In case of fire, passengers are not supposed to jump out of the train. There are different rescue concepts, but they all take time. So the interior materials have to meet the highest fire resistance specifications. In the case of long-distance travel, passengers would expect a certain level of comfort and style, comparable with or superior to first class airline travel. Obviously a new approach was necessary.

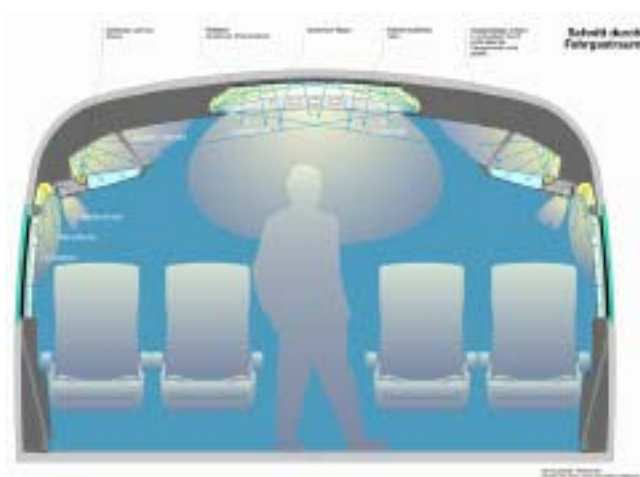
It is our job as designers to bridge the gap between aesthetics, style, and beauty on one side and technology on the other side. We have to understand technology, we have to talk the language of engineers, but at the same time, it is necessary to focus on the experience of the passenger.

2 The Interior of the Transrapid TR08, developed for Hamburg-Berlin.

2.1 Lighting concept



To compensate for the low ceiling and the great width of the passenger compartment, we augmented the indirect lighting above the hat racks by a special light-emitting channel in the middle of the ceiling. The light originates from two rows of fluorescent tubes hidden in the sides of the channel. It is then directed to the floor by a special structure on the reflecting aluminum sheets. The channel was covered with etched glass.



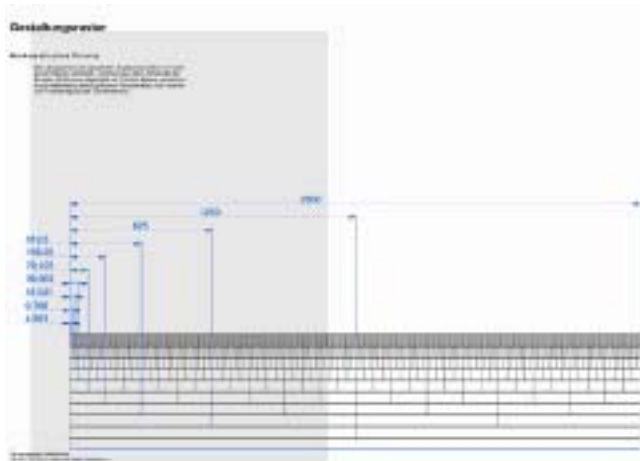
We wanted to impress business class passengers familiar with small airplane windows. We developed the idea of glowing window crossbeams to further enhance the impact of our panoramic windows. The material of the window crossbeams is translucent matt. They are backlit from above to connect the unusually broad windows, generating the feeling of one integral window by day, glowing mysteriously by night.

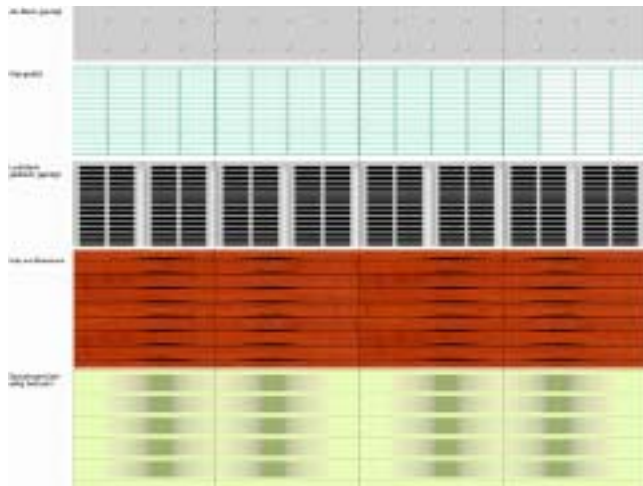
During design implementation, we did build a 1 : 1 prototype to make sure that the lighting was homogenous over the entire width of the car.

2.2 High-tech and high-touch

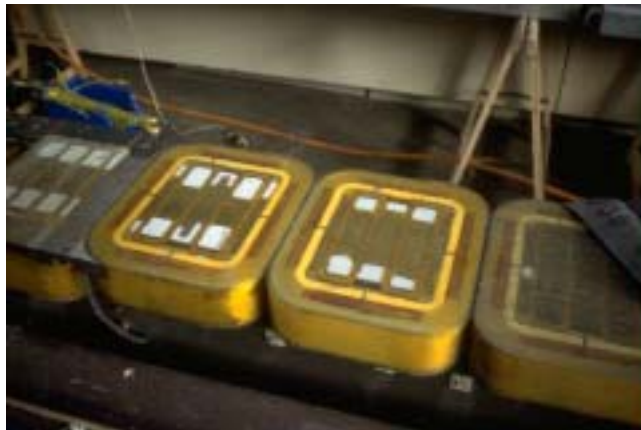


The technical requirements restricted us to use only alucobond or fiber-reinforced plastics for the paneling. We decided to coat the side panels and the ceiling with a very bright metallic lacquer finish in order to give expression to the advanced technical character of the train. To compensate for this hard and cool appearance, we developed a series of patterns and textures, all fitting into the window grid of 2500 mm.

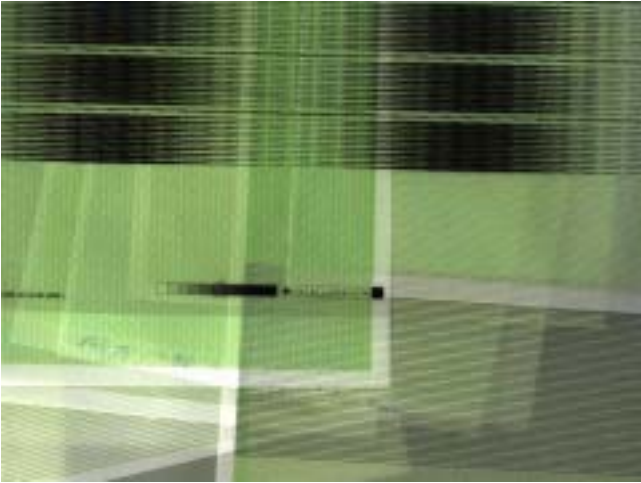




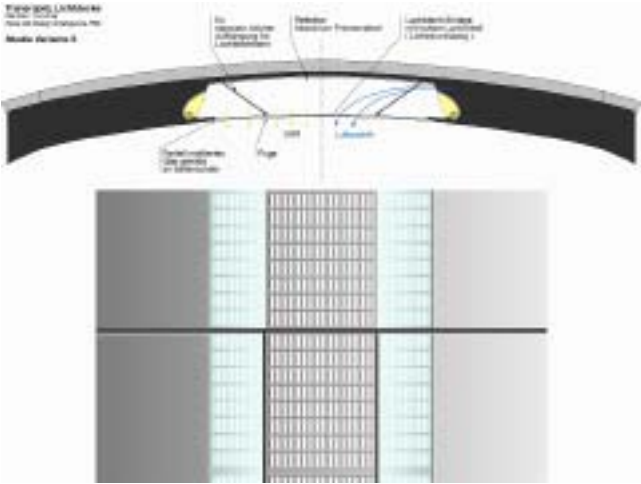
We had a relief on the ceiling panels, an etching pattern for the lighting, a perforation for the hat racks, and two decorative high-pressure laminates for the differentiation of the 2 classes. Looking for a way to reflect the specific technology of the Transrapid, we discovered the ornamental qualities of the electromagnets.



Inspired by the translucent material and the fine repetition of the lamellas, we developed a vibrating moiré pattern for the second class and a calmer wood-based pattern for the first class. During the design implementation, the first-class was omitted altogether, so we concentrated on the second-class pattern. The development happened in close collaboration with Abet Laminati, an Italian specialist for high pressure laminates. Since High-pressure laminates basically consist of pressed layers of paper, we worked with the same technique: putting translucent layers on top of each other, until the right vibration appeared.



2.3 Saving weight

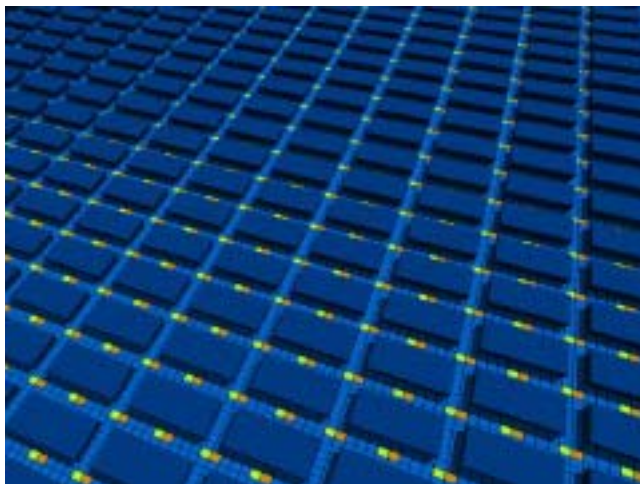




During this implementation phase it became clear, that all the glass on the ceiling and in the entrance areas was really too heavy. In order to save weight, a series of measures had to be taken. The most significant is the integration of the fresh air duct into the light-emitting ceiling channel. Intensive studies with our 1:1 scale mock-ups showed that perforated aluminum sheets could replace the middle section of the glass cover without perceptible loss of lighting quality. This led to another opportunity to save even more weight. We integrated the fresh air ducts into the lighting channel: The fresh air is pumped into the lighting channel at one end and distributed throughout the passenger compartment through the perforated centersection.

2.4 Upholstery fabrics

Seats are obviously quite important for the design of a train interior. In our case, no existing seat system on the market could meet the required specifications. A typical seat for a maglev train should be as robust and cheap as a train seat, while being not much heavier than an aircraft seat. As a stopgap an existing short-distance seat was chosen by the industry for the TR08. So we concentrated on the fabrics. The maintenance guys of the Deutsche Bahn only accepted velvet pile. In order to save some weight again and to achieve a clean, technical look, we proposed to have the velvet pile interrupted by strips of flat fabric.



The relief is very nice to touch, circulates air much easier and allows subtle optical effects by putting colored pixels in between the velvet blocks.



3 Concepts for an urban transport variant

3.1 Initial position

Using the existing prototype TR08 as our prototype, we developed concepts for two typical urban transport situations in close collaboration with Deutsche Bahn. One is the Munich airport express, with only two stops and a travel time of about 10 minutes. The other is the so-called Metrorapid in Nordrhein-Westfalen, an inter-urban express with travel times varying between 5 and 30 minutes.

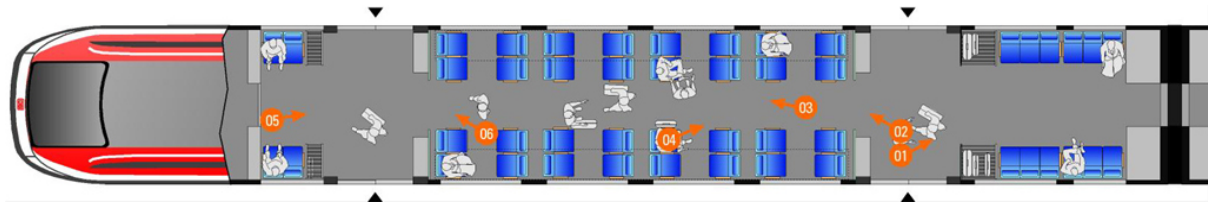


3.2 Different requirements

In both situations the payload will be quite critical, which means that either the access of passengers will have to be controlled at the gate or that the standing areas on board will have to be restricted. Another very interesting theme is the seating. No aircraft or railroad seat on the market at present addresses the special demands of a typical urban maglev transportation system. The development of a new seat seems unavoidable. Furthermore, all surfaces that may come into contact with passengers will have to withstand greater amounts of mistreatment than in the Transrapid TR08.

3.3 New Layouts

New layouts have been developed to meet the specific situations of more commuter oriented short distance travel. The doors have been moved towards the center, the air-condition units have been moved to the ends of the sections. Open standing areas improve the flow of passengers. In the case of the airport express, we expect passengers to carry a lot of big suitcases. Therefore we made sure that passengers could drop the suitcases close to the doors and sit down close by to keep a watchful eye on their belongings.



3.4 Interior Design

The style of the interior design has been adapted according to the guidelines for the short-distance trains of the Deutsche Bahn. The most important part of these guidelines is the color and surface materials concept. A passenger information and entertainment system is placed on the transversal glass walls so that both standing and sitting passengers are able to view it.



