

Utveckling av Höghastighetståg

Transportforum Linköping 2009-01-09

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Agenda

1 **Bombardier – Worldwide experience in high-speed rail**

2 Regina 250 – 300 km/h: High-speed trains for Europe

3 Zefiro 300 – 360 km/h: Very High-speed trains for Europe

Bombardier – Worldwide experience in high-speed rail



 Bombardier share

Bombardier is a key manufacturer in all international high-speed markets for speeds of 200-350 kph and one of the most experienced suppliers of high-speed trains – worldwide.

CRH1 – The “Regina train” for China

The first Chinese high-speed train – CRH1

- Being developed for operation in Chinese standards, it offers a particularly high capacity with 670 seats in 8 cars incl. a bistro area
- It is entirely manufactured in China at Bombardier’s site in Qingdao
- The operational speed of CRH1 is 200 km/h (first train successfully tested at 250 km/h in Dec. 2006)
- The Chinese customer is very satisfied with the product quality, its operating performance and especially with its high reliability and availability

Bombardier is the first foreign supplier to deliver a fully locally made high-speed train in China.



Zefiro250 China – The first high-speed sleeper train

The first high-speed sleeper train – Bombardier Zefiro250

- As the successor of the very reputable CRH1 EMU, in an equal measure the Zefiro250 will deliver the highest level of reliability, availability and operational performance in order to once more convince our customer of the high product quality and trustworthiness of Bombardier.
- Featuring main components of the Bombardier high-speed platform Zefiro, this train is the first step into a new generation of Bombardier high-speed trains.
- Interior design and equipment are setting a new Chinese standard for high-speed rail- and esp. over-night travel with sleeping compartments at highest comfort levels.
- The operational speed is up to 250 kph
- With 16 cars, the train will meet an exceptional length of 430m for one train set.

Fully manufactured in China, the Zefiro250 will be the first high-speed sleeper train worldwide operated up to 250 kph.



Regina IC for SJ – Intercity trains for Sweden

Expanding a successful fleet – SJ's intercity version of Regina trains

- The new IC version of Regina trains will combine highest passenger comfort and reliable operation based on the successful product family
- Jointly developed interior equipment will meet highest Scandinavian passenger expectations and clearly distinguish this version from the Regional trains
- 4-car train consists with wide car bodies are enabling a very high seating capacity on a minimum train length including PRM facilities and a modern bistro area
- An extreme high share of commonalities within the Intercity and Regional fleet ensures minimum life cycle cost and a highly efficient maintenance strategy
- 73 trains in operations since year 2000 with best-in-class reliability and availability
- 20 trains in order with a first delivery year 2010

Being the youngest member of the product family, the order of Regina IC shows both the flexibility of this product and the high trust of our customer in its reliability.



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Regina & Zefiro– Flexible train configuration



Regina Nordic
2- & 3-car



Regina IC
4-car



CRH-1
8-car



Zefiro250
CRH-C & CRH-S
16-car



ZEFIRO250 and REGINA is highly flexible product platform, using similar propulsion technology and a scalable traction concept – forming 2-car to 16-car train consists.

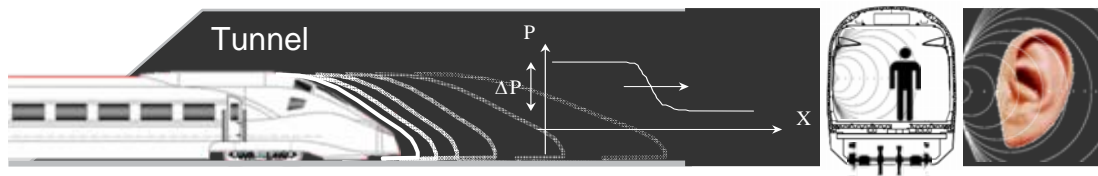
Optimization of aerodynamics

Targets

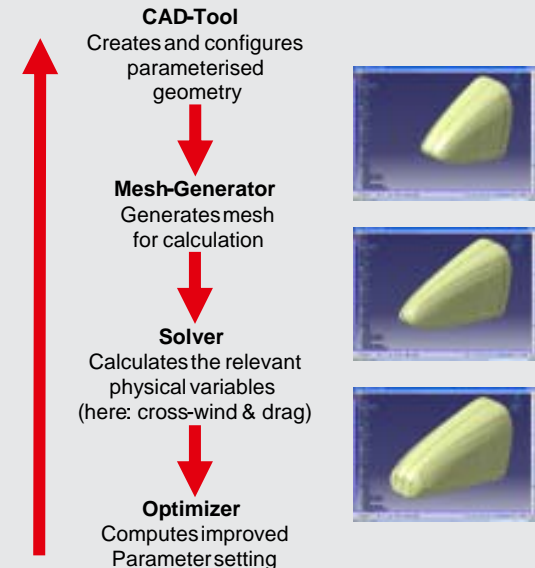
- Less drag
- Less energy
- Cross wind stability

Optimization parameters

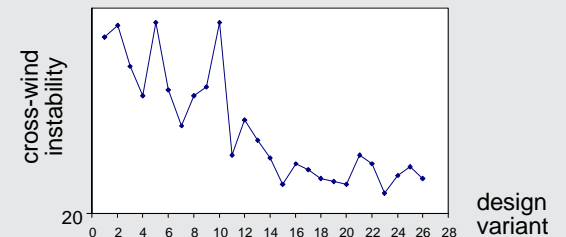
- Reduced head pressure pulses (e.g. a longer nose of the leading vehicle)
- Minimized wake flow velocity (slip stream) during train passing a position near to the track
- Increased capacity of seats per meter (e.g. a nose as short as possible)
- Low roll moments and lift coefficients to increase the cross-wind stability
- Minimized pressure gradient during tunnel cruising (e.g. a certain increase of area over length at the nose region)
- Ergonomics within the drivers cab which limits the freedom of the outer envelope
- Crash structure as constraint for the envelope
- General exterior design appearance of the product



Example – front geometry optimization



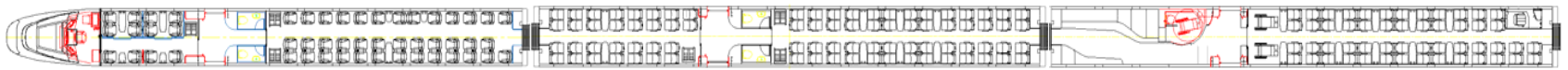
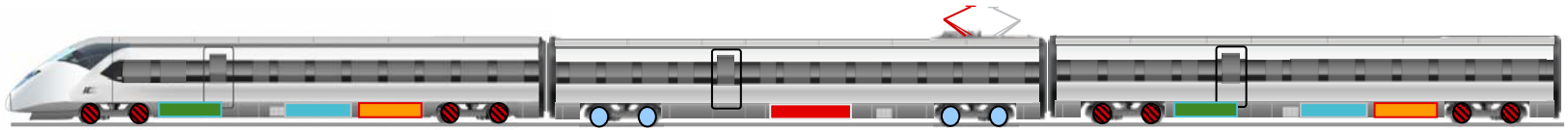
Example – Generic algorithm cross-wind stability



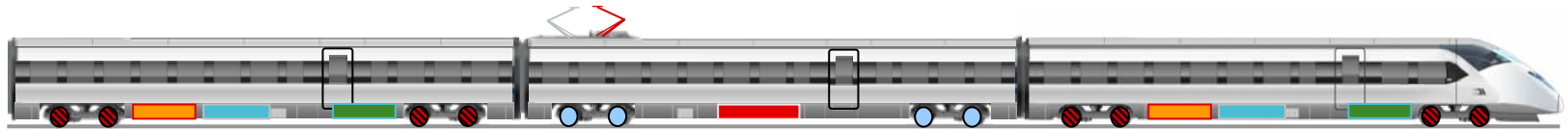





Regina 250 – Train concept overview (UIC profile)




50 seats 1st class 82 seats 2nd class 52(+2) seats 2nd class, PRM & Bistro





82 seats 2nd class 82 seats 2nd class 50 seats 1st class

 Main transformer

 Auxiliary converter

 Motor Bogie

 AC Panto

 Motor converter

 Batteries /-charger

 Trailer Bogie

 DC Panto

Regina 250 - Main technical data (6-car and UIC profile)

Property	Value
Numbers of cars	6 (motorized 4)
Train Length	163 m
TSI Compliance	YES
Multiple Operation	Two trainsets
Max. service speed	250 up to 300 km/h – 25 kVAC/15 kVAC, 220 km/h – 3 kVDC (optional)
Track gauge	1.435 mm
Vehicle Profile	UIC 505-1 (Possible option with wide carbody)
No of Passengers	~400 seats (~510 seats with wide carbody)
Wheel Diameter (new/worn)	915/835 mm
Maximum axle load	17 ton
Car body material	Carbon Steel
External Door Position	Inside bogies, 1 per car side
Door width	1.100 mm
Floor height	1.150 mm
Tilt	No (Possible option)

Regina 250 - 1st class saloon



Regina 250 – 2nd class saloon



Regina 250 – Bistro Area



Regina 250 – Bistro Area



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Zefiro – Key features

- Top-speed range between 300 and 360 km/h
- Non-articulated 8-car train concept allows a flexible arrangement of seats in order to adjust capacities between 450 and 600 seats in an “open tube”
- Compliance with all new international and national standards
- Cross-border operation capability, prepared for different operating voltages
- ETCS L2 and national conventional safety equipment
- Top level passenger comfort
- Interior layout customizable for each operator
- Top levels of reliability & availability
- Design for maintainability and obsolescence
- Low energy consumption and LCC

Key values of the Zefiro:

- Low energy consumption per seat
- High reliability and availability (proven solutions and technologies)
- High operational flexibility
- High capacity

Zefiro – General technical parameters (1)

Wide speed range	From 300 km/h to 360 km/h
Multi-voltage	25 kV AC; 15 kV AC; 3 kV DC; 1.5 kV DC
Wide seating capacity range	From 450 up to 600 seats + 2 wheelchair seats including a snack bar coach inside the train
Seats	Customized according client needs and brand image
Interiors	Colours and patterns customized according client needs and brand image
Number of toilets	Provision for 2 toilet per car for a total of 15 per train (1 toilet PRM)
Number of external doors	Provision for two doors per car and per side
Train accessibility	Optimized for platform of 550 and 760 mm
Driver's desk	European drivers desk or customized according client needs
Car body	Open tube concept for easy configuration of layout
Style	Shapes and colour schemes in accordance to client needs and brand image

Zefiro – General technical parameters (2)

Number of Cars	8 (motorized 4)
Train Length	201.6 m
TSI Compliance	Yes
Multiple Operation	Yes (two train sets)
Track gauge	1,435 mm
Vehicle Profile	UIC 505-1
Ambient temperature	-25°C to +45°C
Maximum rail power	8,800 kW (25kVAC, auxiliary status: half)
Start Acceleration	0.58 m/s ²
Retardation	0.35 m/s ² at 300-230 km/h 0.60 m/s ² at 230-0 km/h
Driven axles	16/32



Thank you for your attention.