Efficient High Speed Train Interiors
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• **Analysis** of: passengers‘ **demands of comfort / troubles** for passengers

Resultant **behaviour** of passengers

**troubles** for (further) **passengers** and the **railway company**

**Main problem:** Luggage *causes troubles*:
• when **boarding the train / moving along in the train / when storing**

⇒ **Aftereffect:** **Passengers** behave that way, to **reduce** their own **problems**, but enlarge other passengers‘ or the railway company‘s difficulties!
Storing luggage - problems

15-30kg

185-200cm

15-30kg

Mostly only overhead racks!

Height of overhead rack

Width of seats, large diagonal

Luggage weight

Large torque, large force!

Safety risk for sitting passengers

- Large exertion
- Safety risks

→ negativ sensation
Summary of actual passenger behaviour

Passengers want to
• avoid lifting their luggage!
• have visual contact of their own luggage!

If it is possible somehow:
→ Luggage is stored on floor level
→ Luggage is stored nearby

Aftereffect:
• Luggage is stored on/ before seats, in the aisle, etc.

→ Comfort restrictions
→ Lower number of actual available seats
→ Problems when moving along in a train
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Illustration of actual passenger behavior

Luggage put down in such a way it disturbs: Problems when moving along and for the boardservice

Passengers do have to stand!

Seats are blocked
Illustration of actual passenger behavior

50% of the luggage rack is not used, however: Luggage is stored on seats and in the aisle!

Although some seats are theoretical free: Passenger has to sit on his suitcase!
Luggage put down in such a way it disturbs:

Problems when moving along and for the boardservice.

Seats are blocked: Passengers do have to stand!

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Although some seats are theoretical free:

Passenger has to sit on his suitcase!

50% of the luggage rack is not used, however:

Luggage is stored on seats and in the aisle!

Blocked entrance!

Illustration of actual passenger behavior
Aftereffect of difficulties when storing luggage

Utilisation rate of passenger cars

- 50% utilisation
- 80% actual utilisation!
Aftereffect of difficulties when storing luggage

Utilisation rate of passenger cars

- 20% occupied
- 100% actual utilisation!
- 80% utilisation

Rate of all seats

Rate of taken seats

Available
Occupied
Passengers

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**Consequences – Railway interiors design**

Total optimum: number of seats – luggage racks is essential!

*Maximising the number of seats in a waggon* at the expense of useful luggage depositions only *reduces the actual utilisation rate!*

By reducing the number of seats in a waggon the utilistaion rate will rise. Also the total number of available seats will increase!

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**Luggage depositions** have to be located **at ground level.**
Passengers must be able to have **visual contact** of their own luggage.

*If those two basics are not considered depositions will hardly be used!*
Efficient luggage storing

Knowledge about
- volume of luggage
- frequency distribution of luggage-items
- frequency distribution of luggage size

- storage must be as easy as possible, passengers don‘t want to manipulate their luggage to much. (e.g.: passengers like to store trolleys upright and don‘t want to tilt them, etc.)

- This knowledge must be the basis for luggage rack design!
Efficient luggage storing

Knowledge about

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Max. dimensions: 85 x 65 x 35 cm

UIC Leaflet 562: 70 x 50 x 30 cm!!

- Large suitcase
  - < 65 cm
  - < 85 cm
  - < 35 cm

- Medium suitcase
  - < 65 cm
  - < 85 cm
  - < 35 cm

Trolley upright

< 35 cm

< 65 cm

< 85 cm
Space between seats – today’s examples

Bad solutions – no space for large items!
Space between seats – today’s examples

zero - version

0 large suitcase
0 trolley upright
1 small suitcase

1 medium carpetbag
Space between seats – today’s examples

Good solutions – enough space for large items

- 64 cm (1. Kl)
- 46 cm (2. Kl)

- 50 cm
Space between seats – today’s examples

optimal - version

no lost space

1 large suitcases
2 trolleys upright
2 medium suitcases

32 cm

3 large carpetbags
luggage racks – dimensions

- Bad example: 70 cm x 60 cm = 63 cm
- Medium suitcase: 63 cm
- Medium, large carpetbag: not efficient
- Trolley, upright: not efficient
- Large suitcase: (X)
luggage racks – dimensions

105 cm

60 cm

75 cm

large carpetbag

medium carpetbag

trolleys upright

medium suitcase

large suitcase

63 cm

70 cm

60 cm

bad example

medium, large carpetbag

not efficient

large suitcase

large carpetbag

not efficient

large carpetbag

not efficient

large suitcase
luggage racks – dimensions
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luggage racks – dimensions

No side walls in the bottom leading area.
Use angle of seat back and space to full capacity
location of luggage storing

- luggage rack near the entrance
- High risk of theft
- No visual contact
location of luggage storing

- 2 large racks in the middle of the saloon

**unfavourable: conflicts with passenger flow**
location of luggage storing

- 2 large racks in the middle of the saloon

**unfavourable:** long view distance for the bigger part of passengers
location of luggage storing

- much better split-up of luggage storing, nearly no conflicts with passenger flow
- luggage nearby the passenger, better feeling of safety
- fewer conflicts with passenger flow

![Diagram showing luggage storage options]

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• **even better**: additional more face to face seat groups

• much better **split-up of luggage storing**, nearly no conflicts with passenger flow luggage nearby the passenger, better feeling of safety

• much better **visual contact**