Observed Customer Standing Behaviours and Seat Preferences on Board Subway Cars in New York City

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Notice: Opinions expressed in this presentation are those of the authors and do not necessarily reflect the official policy or position of the Metropolitan Transportation Authority, Metro-North Railroad, or New York City Transit Authority.
Diverse Seating Layouts in Subways
U.S. Subway Systems

• New York City
  – Mainly longitudinal seating
  – All cars built after 2000 are longitudinal
  – Except extra large (75’) cars

• Chicago
  – Traditionally followed other cities
  – New 5000-series has modified longitudinal layout
  – Older cars retrofitted

• Other U.S. Cities
  – Mostly transverse seating (similar to commuter rail cars)
  – Longitudinal seats near doors
New York City Fleet

• Asymmetric door arrangement
  – System’s oldest fleet (R-32)
  – Recently retired fleet from 1960s
  – Half of numbered-line fleet (non-cab R-142/R-142A)
  – Concept is largely unique to NYC

• Symmetric door arrangement
  – Majority of current NYC cars
  – Prevalent elsewhere in the world

• Combination of transverse and longitudinal seats
  – Only on 75-foot-long cars
  – Only 40% of seats are transverse
Study Methodology

- Over 60 samples recorded
- Each sample is one car traveling non-stop between two adjacent stations
- Customers classified by gender and age group
Probability Snapshots: Seating

Door, Middle, Other
Probability Snapshots: Seating

Door/Wall, Middle, Pole

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Probability Snapshots: Seating

Forward, Backward* (75’ cars)

* Data collected is not sufficient to make a definitive conclusion. Further study is recommended.
Probability Snapshots: Seating

Window, Aisle, Longitudinal
(75’ cars)

* Data collected is not sufficient to make a definitive conclusion. Further study is recommended.
Gender Ratio, Standees to Seated: Male versus Female

![Graph showing the ratio of standees to seated passengers by load factor within car for female and male passengers.](image)
Probability Snapshots: Seated versus Standees

![Graph showing the relationship between fraction of spots occupied and load factor within a car, with data points for seated and standees.]
Probability Snapshots:
Pole versus No Pole

Fraction of Spots Occupied vs. Load Factor within Car

- Seated
- Pole
- Non-Pole
Probability Snapshots: Standees
Door, End, and Middle

![Graph showing the probability of spots occupied versus load factor within a car for seated, door standee, end standee, and mid standee positions.]

- Seated
- Door Standee
- End Standee
- Mid Standee
Probability Snapshots: Doors in Symmetrical versus Asymmetrical

Graph showing the fraction of spots occupied against the load factor within the car, with different markers for Seated, Asym Non-Door, Sym Non-Door, Asym Door, and Sym Door.
Conclusions: New York

• Preference for seats next to doors
• No real preference for seats adjacent to stanchions
• Disdain for spots between two seats
• Window transverse seats are preferred where available, regardless of travel direction*
• Standees crowd door areas, especially with symmetric doors
• Standees prefer spots where they can hold on to vertical poles

* Data collected is not sufficient to make a definitive conclusion regarding forward- vs. backward-facing seat preference. Further study is recommended.
Talking About Car Design...

- Longitudinal seats maximize overall car capacity
- Transverse seats provide customer-preferred windows
- 2+2, even 2+1 transverse seats should be avoided in urban areas (aisle seats create blocking and circulation problems)
- Partition on long benches avoids appearance of “middle” seat, and discourages lying down
- Because poles attract standees, they should be moved away from doors, to reduce congestion
- Customers tend to especially crowd symmetric door areas, so asymmetric arrangement could reduce crowding by the doors.
- Areas that become crowded during crush load should have overhead supports
Open Research Questions

• In subway cars, how does the ratio of transverse/longitudinal seats relate to ridership, crowding, and station spacing?
• Should seats be homogenous or should options be provided within a train or even a single car?
• Stated preference surveys could determine perceptions; customers could rank renderings
• Individual hardware items (e.g. poles) could be tested in existing cars to determine effects
• On commuter trains, what is a good ratio of airline-style versus booth seating?
• In cars with fixed forward- and backward-facing seats, should seats face towards door or away?
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