Evacuation from the Upper Deck: Merely an Exit Problem?

(if a problem at all)

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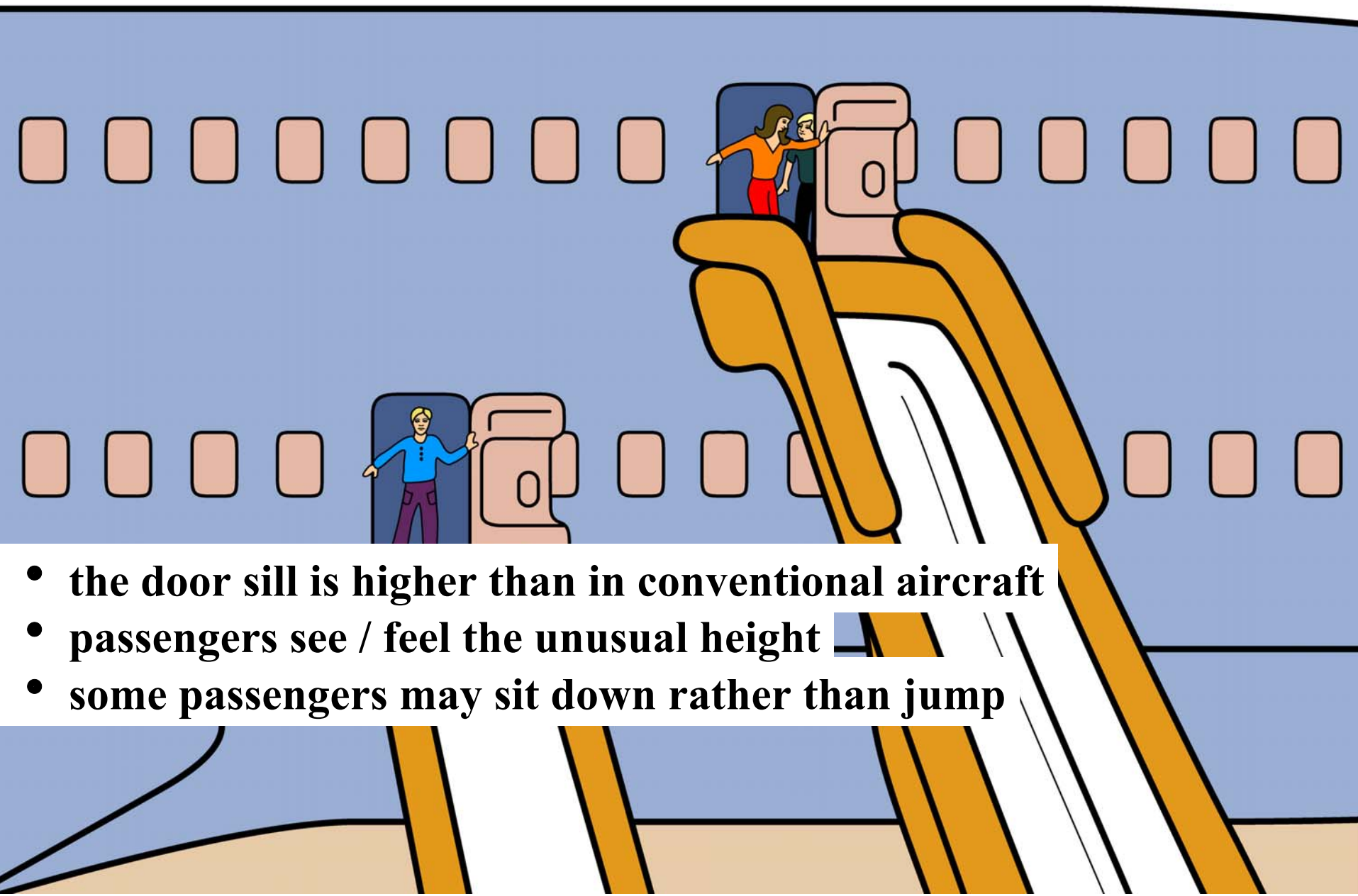
- **Why is this issue attracting increasing attention?**
  - the aircraft stimulates the fantasy and provokes images
  - there is intense competition and airlines think twice
- **Why are companies and authorities negotiating?**
  - a full scale demonstration test
  - a partial test supplemented by computer simulation
- **Why not run a full scale demonstration test?**
  - more injuries during a test due to more participants
  - higher egress time / more injuries due to aircraft features

At a first glance:

an exit problem !



- **the door sill is higher than in conventional aircraft**
- **passengers see / feel the unusual height**
- **some passengers may sit down rather than jump**

Jungermann et al., Atlantic City 2001

- some passengers may hesitate

Jungermann et al., Atlantic City 2001

❒ Determinants of behavior at the exit

- **situational factors**
  - **configurational**
  - **environmental**
  - **procedural**
  - **social**
- **dispositional factors**
  - **mental**
  - **physical**
- **reactions**
  - **cognitive**
  - **emotional**
  - **physiological**

❒ An investigation of behavior at the exit

- aim of the first part of the study: developing methods
- setting of the study: double-deck mock-up with 42 seats
- methods: questionnaires and video recording

- major findings:
  - exit hesitation time on upper deck was slightly higher
  - physical attributes had stronger effect on upper deck
  - critical behavior exhibited by only a few subjects

❒ Some conclusions

- **conclusions *not* to be drawn from these data ...**

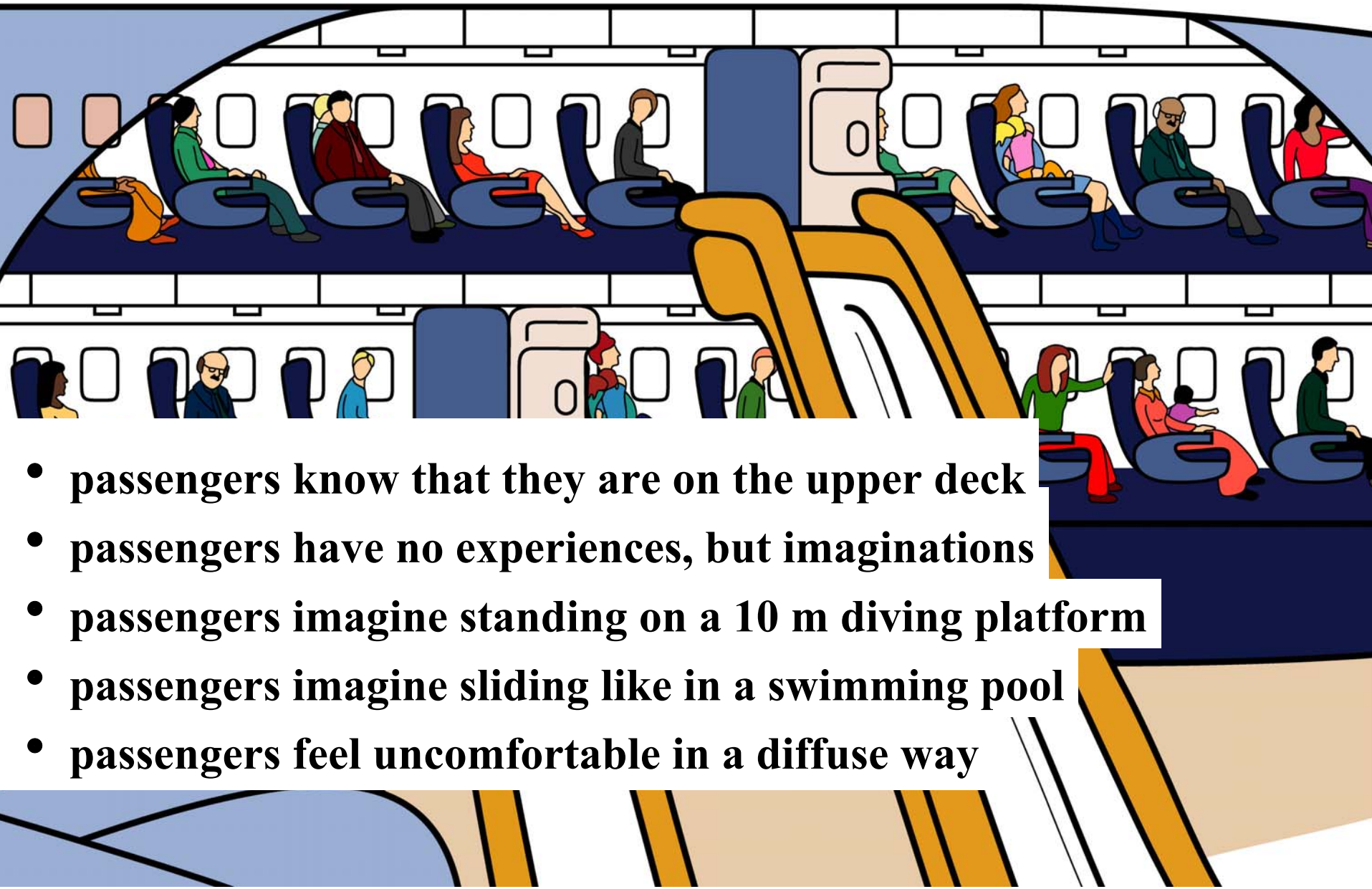
  ! in particular regarding exit hesitation time

- **observation: cognitive „tunnel“ vision**
- **methods: provide objective and relevant data**
- **research needs: behavior under different conditions**

  ! in particular when visibility is restricted

At a second glance:

perhaps (also) a cabin problem !

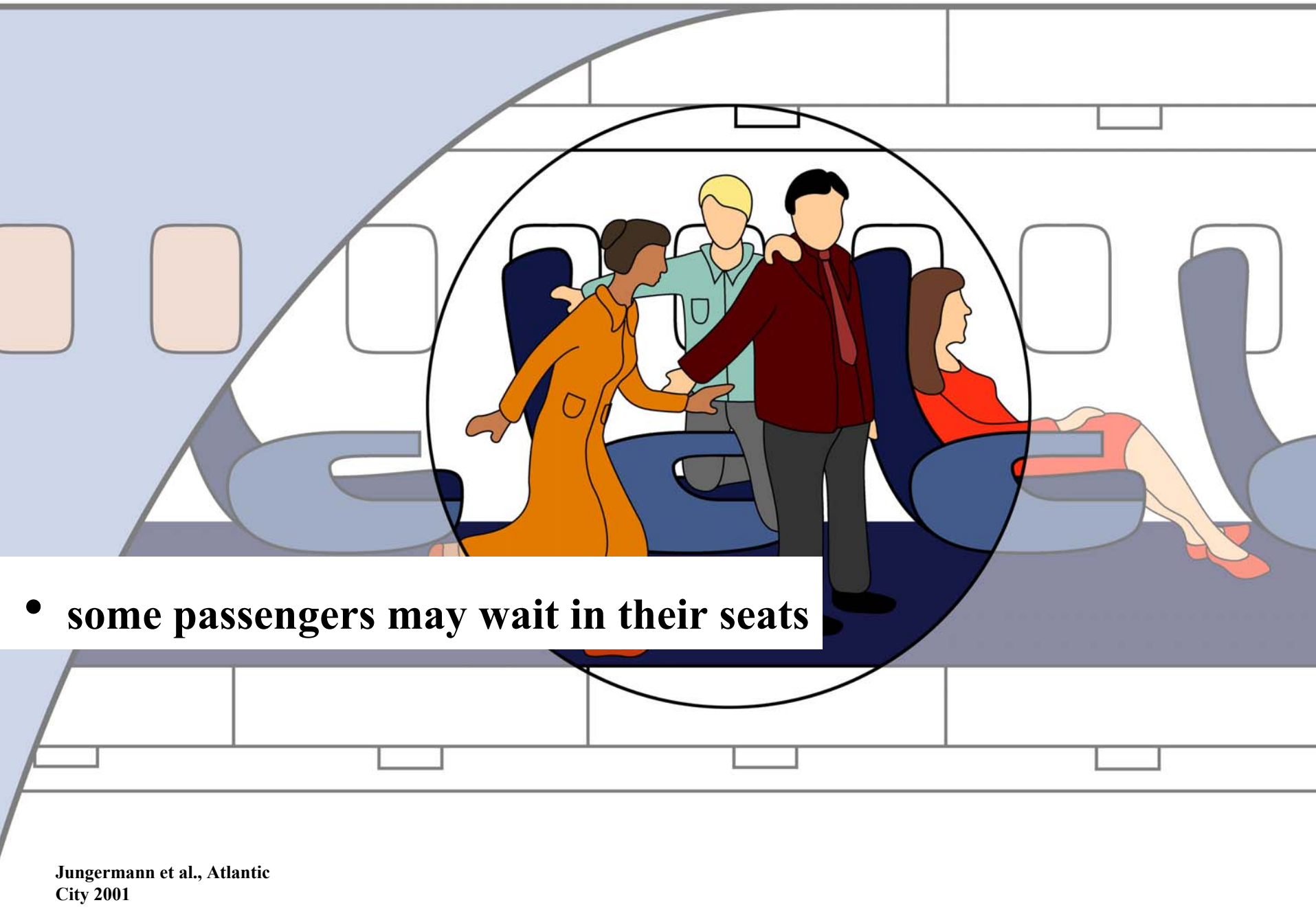


- passengers know that they are on the upper deck
- passengers have no experiences, but imaginations
- passengers imagine standing on a 10 m diving platform
- passengers imagine sliding like in a swimming pool
- passengers feel uncomfortable in a diffuse way

Jungermann et al., Atlantic City 2001

- some passengers may cause jams in the aisle
- some passengers may head for the lower deck

Jungermann et al., Atlantic City 2001



- some passengers may wait in their seats

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- some passengers may decide to sit down at the exit
- some passengers may hesitate at the exit

Jungermann et al., Atlantic City 2001

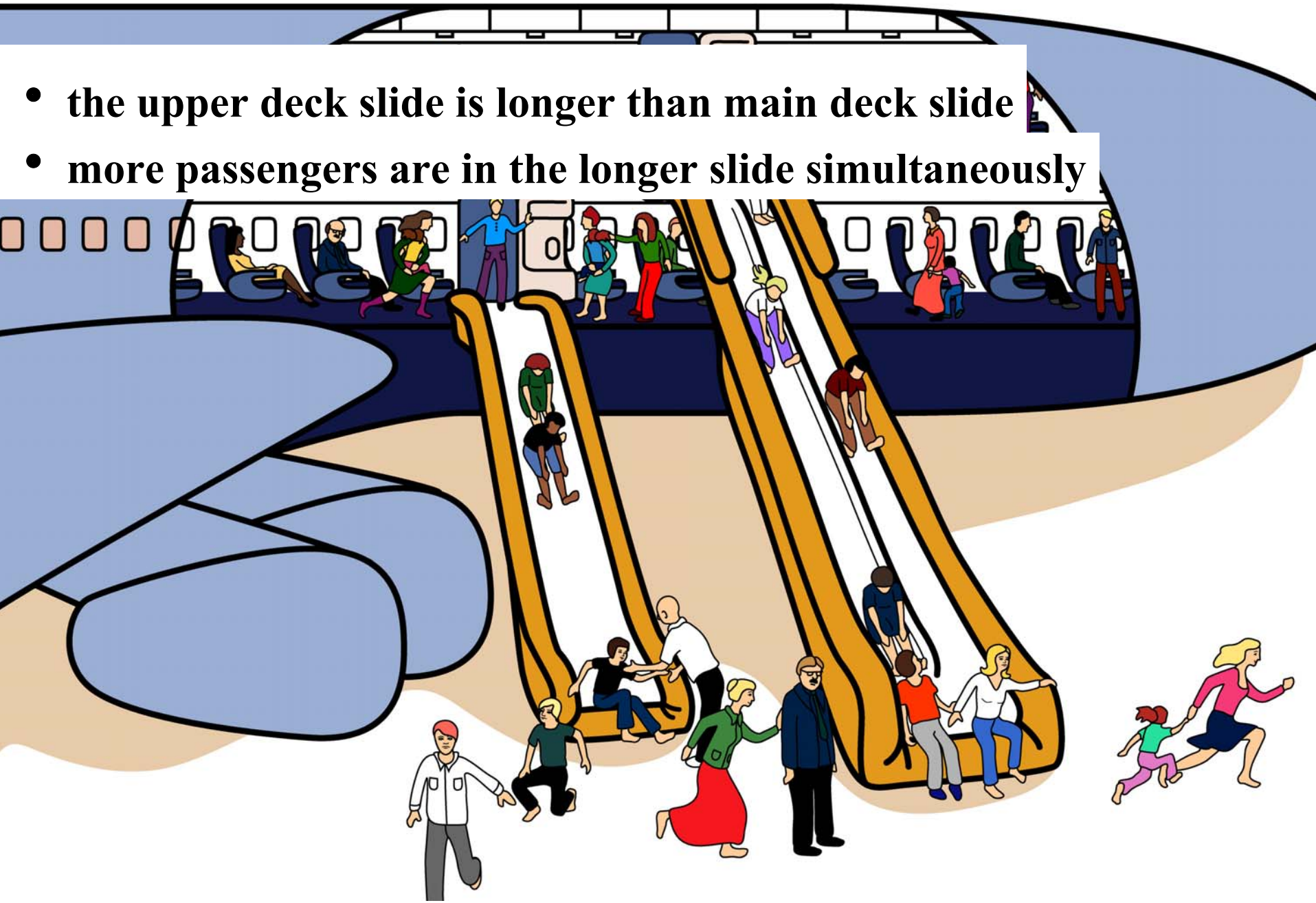
❒ Some conclusions

- mental preparation for evacuation behavior
- for instance, a video
  - which demonstrates a jump in slow motion
  - which is accompanied by precise instructions

At a third glance:

(also) a ground problem ?

- **the upper deck slide is longer than main deck slide**
- **more passengers are in the longer slide simultaneously**



Jungermann et al., Atlantic City 2001

- **more frequently jams at the bottom of the slide**
  - **injured passengers are unable to leave**
  - **evacuees remain standing at the bottom**

Jungermann et al., Atlantic City 2001

❒ Potential effects on passengers in the exit

- **passengers at the exit see the situation on ground**

  - and hesitate

- **passengers at the exit hear screaming**

  - and hesitate

❒ Some conclusions

- provide mental preparation of passengers
- give efficient instructions for passengers
- devise new procedures for fire brigade
- design the slide environment at the bottom

- **What follows from these observations and ideas?**
  - comprehensive analyses of the entire sequence
  - increased egress times or higher probabilities of injury

    may have their origins

    - in the cabin (e.g., unpreparedness for jump)
    - at the exit (e.g., intimidation by height)
    - on the ground (e.g., jam of injured evacuees)
- **What about simulation?**
  - simulation models are useful but not sufficient
  - models need data for estimating parameters

Jungermann et al., Atlantic City 2001

- **Evacuation from the upper deck – a problem at all?**
  - **possibly not – but we just don´t know**
  - **empirical tests (plus simulation) are needed**
  - **tests should be conducted by companies and airlines**
  - **... and should be requested by the authorities**

- **Even if egress times and probabilities of injuries are *not* increased ...**
  - **tests would provide useful insights and data**
    - **to provide risk reduction measures**
    - **to improve the efficiency of evacuation management**
    - **to increase customers´ trust in the new aircraft**

Jungermann et al., Atlantic City 2001

Empirical tests can´t make evacuations safe, but safer.

Jungermann et al., Atlantic City 2001