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
some passengers may hesitate
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
• some passengers may cause jams in the aisle
• some passengers may head for the lower deck
• some passengers may wait in their seats
• some passengers may decide to sit down at the exit
• some passengers may hesitate at the exit
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
- more frequently jams at the bottom of the slide
- injured passengers are unable to leave
- evacuees remain standing at the bottom
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
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
Empirical tests can’t make evacuations safe, but safer.