8th Triennial International Aircraft Fire and Cabin Safety Research Conference

Safety Briefings: Interactive and Non-Interactive Solutions

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Acknowledgements

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Contents

- **Motivations:**
  - Need to better understand current safety briefing media and their effectiveness
  - Need to improve current safety media
- **Study.** Controlled experiment to contrast effectiveness of:
  - Safety briefing card
  - Safety briefing video
  - Safety briefing video with basic interactive controls
- **Conclusions and future work**

Safety Briefing Media

- Aviation regulations require airlines to provide safety briefings and briefing cards to inform passengers of cabin safety procedures (e.g., 14 CFR 121.571, 125.327, 135.117)

- Current safety briefing media:
  - Safety briefing **card**, in all cabins
  - Safety briefing **video**, in cabins with screens

- The literature highlighted comprehension and recall issues in current safety briefing media (Corbett & McLean, DOT/FAA/AM-08/20, 2008; Seneviratne and Molesworth, 2015)

Goals of the study

- We carried out a controlled study to compare the effectiveness of different types of safety briefing media
- In addition to the safety briefing card and safety briefing video, we considered the introduction of basic interactivity in safety briefing videos
- In particular, we extended the safety briefing video with **basic interactive controls** (go to the next step of the safety procedure, pause, replay last safety procedure)

Contents of the Safety Briefing

- The considered briefing provided information about the following topics:
  - use of safety belts
  - location and use of oxygen mask
  - assuming a brace position
  - location and use of life vest
  - location of emergency exits
  - opening procedure for floor exits
  - opening procedure for wing exits

Safety Briefing Media Created for the Study

- To avoid introducing confounding variables, the three briefings employed the same computer-generated graphics
- The three media were:
  - **Safety Briefing Card:** participants examined a safety card that presented the safety procedures through pictograms based on the computer-generated graphics
  - **Safety Briefing Video:** participants watched on a tablet a video that presented the safety procedures through animations based on the computer-generated graphics
  - **Safety Briefing Video with Basic Interactivity:** participants watched the same Safety Briefing Video on the same tablet, but the animations paused at each step of the safety procedures, and offered the basic interactive controls

Design Considerations

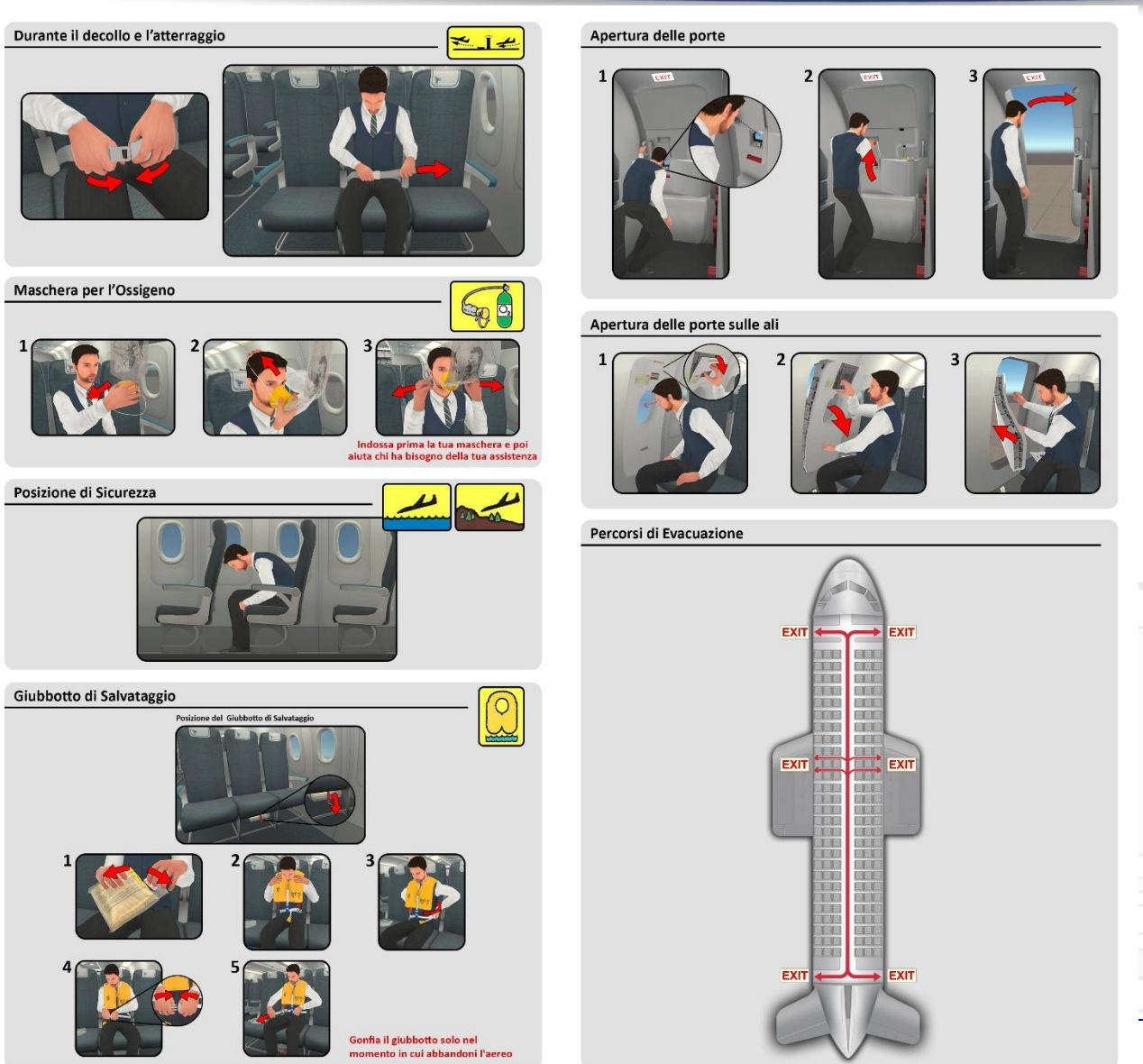
- **Safety Card:** to choose the pictograms to generate with computer graphics, we examined typical choices of current safety cards of some major airlines

- **Safety Briefing Video:**
  - In the video, two flights attendants speak to the passenger:
    - One flight attendant introduces the passenger to the different topics, and brings the passenger around the virtual cabin to show the location of the different exits
    - The other flight attendant is the one depicted in the safety card, and demonstrates the procedures for equipment use (seat belts, oxygen masks, doors) and the brace position
  - We took into account the indications of (Barkow & Rutenberg, 2002), e.g., the voice of the speakers should not be monotone, they should not speak fast, they should use simple, non-specialized language,…

Introducing Basic Interactivity into the Safety Briefing Video

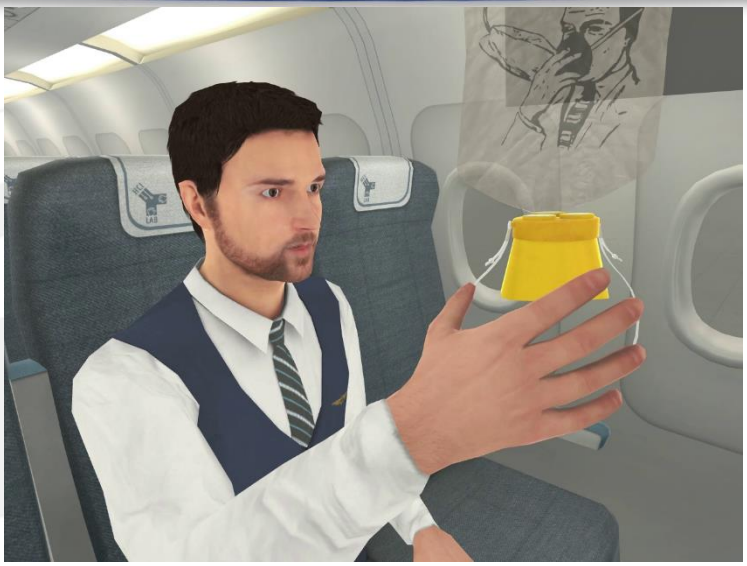
- We started from the following considerations (from the Learning and Instruction literature):
  - Provided that they are intuitive to use, adding **basic interactive controls** (e.g., stopping, replaying, adapting pace) to a video presentation should improve learning (Schwan & Riempp, 2004; Merkt et al., 2011)
  - On a touchscreen, **dragging gestures** - instead of simple taps - may positively influence understanding of content (Dube & McEwen, 2015)

Safety Briefing Card



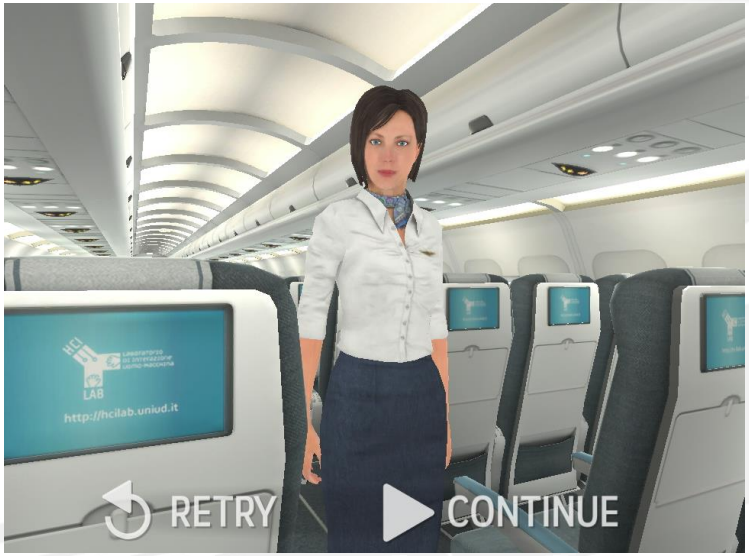
Safety Briefing Video

Video



Safety Briefing Video with Basic Interactivity

Demo



Study

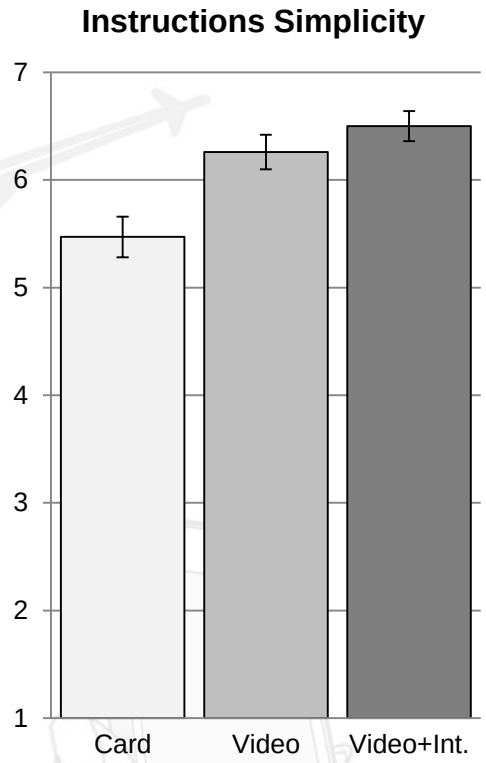
- **Participants:** 66 (60 M, 6 F), undergraduate students
- **Age**: from 20 to 29 (M=21.64, SD=1.58)
- **Flights (last 2 years):** from 0 to 8 (M=1.47, SD=2.18)
- **Procedure:** After using the briefing media, we tested participants' knowledge by asking them to try (i) fastening real seat belts, (ii) wearing a real oxygen mask, (iii) physically assuming the brace position, (iv) donning a real life vest. We then tested knowledge about exit doors by showing them a picture of each door type (wing, floor), and asking to explain how to open it. Finally, they had to draw evacuation paths on a printed seatmap
- **Measures:**
  - **Instructions simplicity and efficacy**
  - **Knowledge application**
  - **Self-efficacy** (before and after using the briefing media)
- Statistically significant results are illustrated in the following slides

Questionnaires

- All items rated on a 7-point scale (1=not at all, 7=very)
- **Self-efficacy.** "I feel confident about my ability to… (i) "reach the aircraft exits, (ii) "wear the oxygen mask", (iii) "assume the brace position", (iv) "fasten the seat belt", (v) "don the life preserver", (vi) "open the aircraft doors"
- **Instructions simplicity.** "The received instructions are…" (i) "simple", (ii) "easy to learn", (iii) "easy to carry out"
- **Instructions efficacy.** "The received instructions…" (i) "are useful for my safety", (ii) "are effective to face an aircraft emergency", (iii) "allow one to greatly reduce the probability of getting hurt in an aircraft emergency"

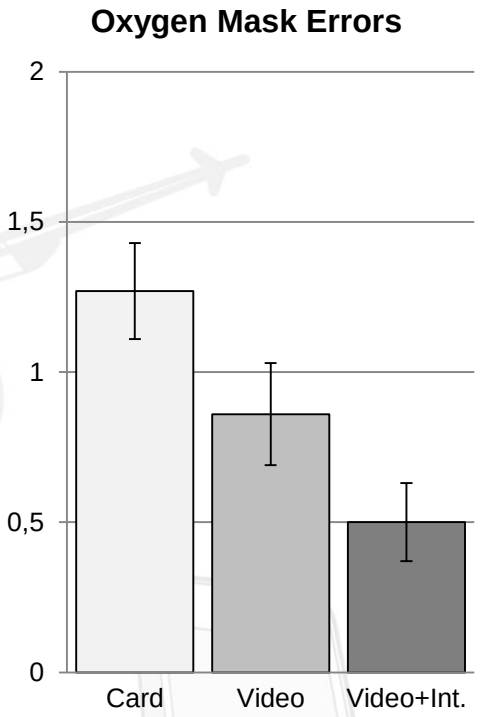
Results: Perceived Instructions Simplicity

- ANOVA: Significant effect of type of briefing, $F(2, 63)=6.38$, $p<0.001$, $\eta_p^2=0.26$
- Post-hoc (Bonferroni test):
  - Significant difference ($p<0.01$) between Card ($M=5.47$, $SD=0.88$) and Video ($M=6.26$, $SD=0.76$)
  - Significant difference ($p<0.001$) between Card ($M=5.47$, $SD=0.88$) and Video With Basic Interactivity ($M=6.5$, $SD=0.64$)



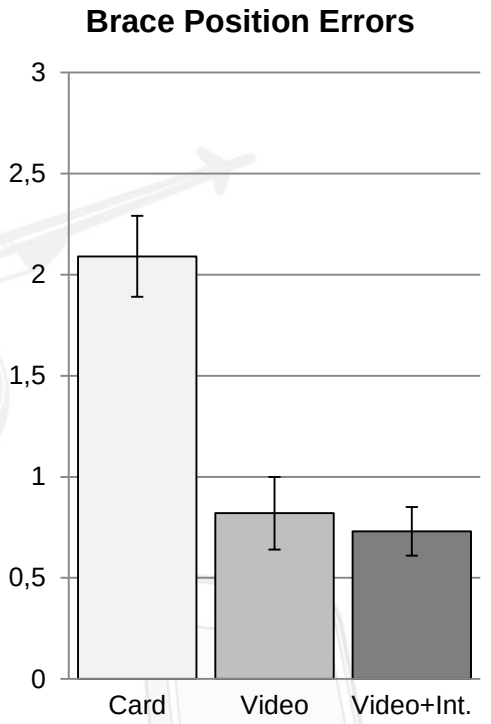
Results: Number of Errors (Oxygen Mask)

- Participants had to perform the procedure with a real oxygen mask
- Kruskal-Wallis Test: Significant effect of type of briefing $\chi^2(2)=10.73$, $p<0.01$
- Post-hoc (Mann-Withney test):
  - Significant difference ($p=0.001$) between Card ($M=1.27$, $SD=0.77$) and Video With Basic Interactivity ($M=0.50$, $SD=0.60$)



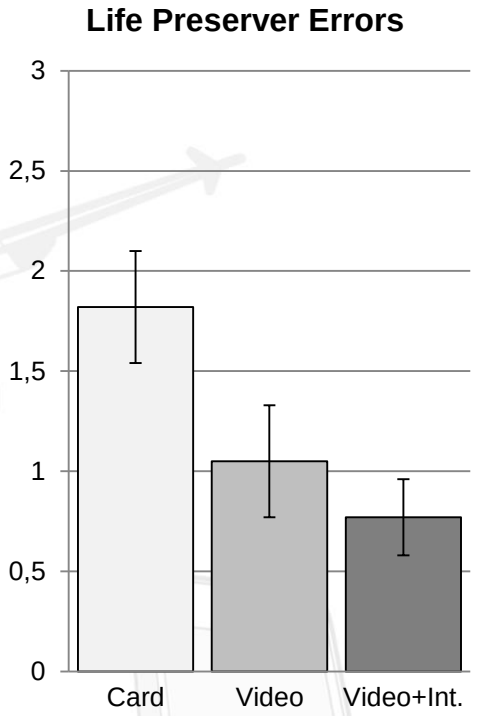
Results: Number of Errors (Brace Position)

- Participants had to assume the brace position
- Kruskal-Wallis Test: Significant effect of type of briefing, $\chi^2(2)=25.35$, $p<0.001$
- Post-hoc (Mann-Withney test):
  - Significant difference ($p<0.001$) between Card ($M=2.10$, $SD=0.92$) and Video ($M=0.82$, $SD=0.85$)
  - Significant difference ($p<0.001$) between Card ($M=2.10$, $SD=0.92$) and Video With Basic Interactivity ($M=0.73$, $SD=0.55$)



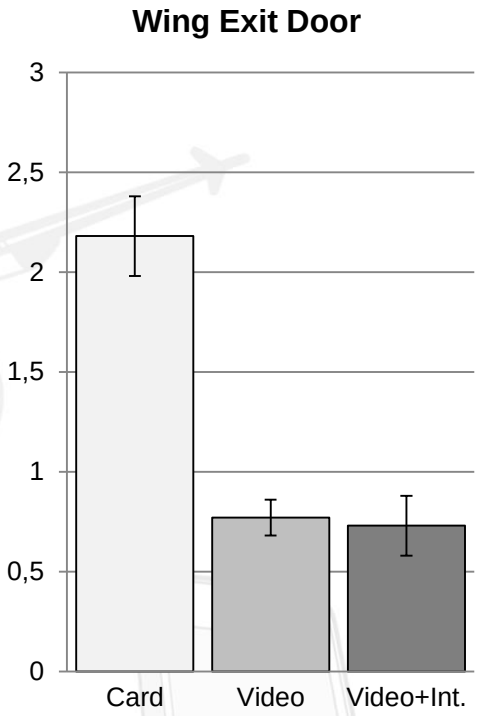
Results: Number of Errors (Life Preserver)

- Participants had to don a real aircraft life preserver
- Kruskal-Wallis Test: Significant effect of type of briefing, $\chi^2(2)=10.01$, $p<0.01$
- Post-hoc (Mann-Withney test):
  - Significant difference (p=0.02) between Card (M=1.81, SD=1.33) and Video (M=1.05, SD=1.29)
  - Significant difference (p=0.001) between Card (M=1.81, SD=1.33) and Video With Basic Interactivity (M=0.77, SD=0.87)



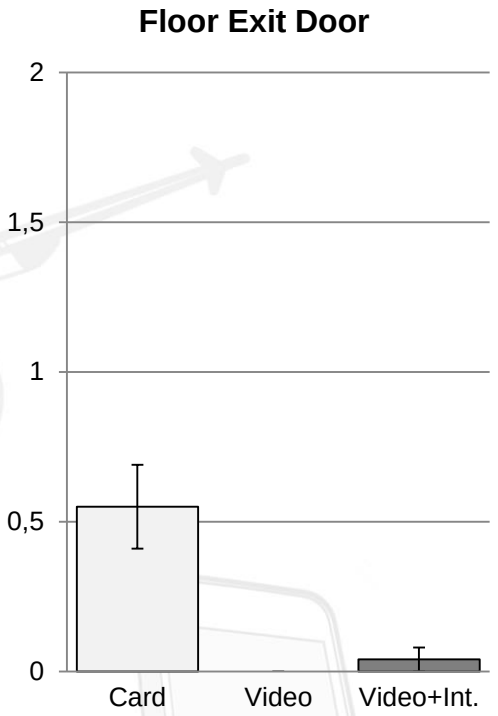
Results: Number of Errors (Wing Exit Door)

- Participant had to look at a picture of the wing exit door, and explain how to open it
- Kruskal-Wallis Test: Significant effect of type of briefing, $\chi^2(2)=29.98$, $p<0.001$
- Post-hoc (Mann-Withney test):
  - Significant difference ($p<0.001$) between Card ($M=2.18$, $SD=0.96$) and Video ($M=0.77$, $SD=0.43$)
  - Significant difference ($p<0.001$) between Card ($M=2.18$, $SD=0.96$) and Video With Basic Interactivity ($M=0.73$, $SD=0.70$)



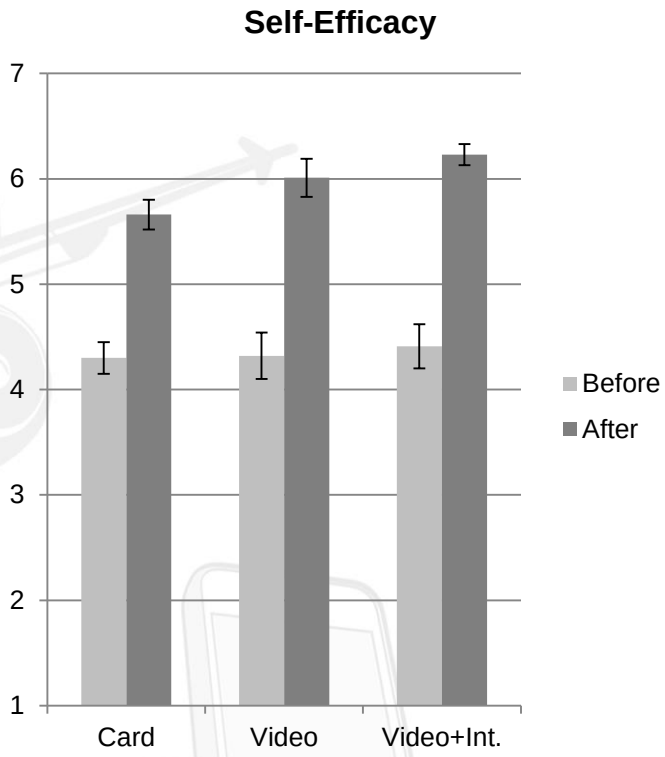
Results: Number of Errors (Floor Exit Door)

- Participant had to look at a picture of the floor exit door, and explain how to open it
- Kruskal-Wallis Test: Significant effect of type of briefing, $\chi^2(2)=19.63$, $p<0.001$
- Post-hoc (Mann-Withney test):
  - Significant difference (p=0.001) between Card (M=0.55, SD=0.67) and Video (M=0)
  - Significant difference (p=0.003) between Card (M=0.55, SD=0.67) and Video With Basic Interactivity (M=0.04, SD=0.21)



Results: Self-Efficacy

- ANCOVA of the after-value with the before-value as co-variate, as recommended in Cohen (2013) for before-after studies:
  - Significant effect of type of briefing, $F(2, 62)=4.78$, $p=0.012$, $\eta_p^2=0.13$
- Post-hoc (Bonferroni):
  - Significant difference ($p=0.02$) between Card ($M=5.66$, $SD=0.65$) and Video with Basic Interactivity ($M=6.23$, $SD=0.48$)



Discussion and Conclusions

- In summary, the study showed that:
  - the two briefings that employed animation and sound (Video, and Video with Basic Interactivity) were much more effective than the Card briefing
  - for some measures, only the Safety Briefing Video with Basic Interactivity was able to produce a statistically significant difference with respect to the Safety Briefing Card
- This indicates that:
  - a safety briefing video can be a much more effective solution than a safety briefing card
  - even a basic level of interactivity (as the one considered in this study) can contribute to improve the effectiveness of a safety briefing video
  - more advanced briefing interactivity is worth exploring

Next Step: Exploring More Advanced Interactivity

- Introducing more advanced interactive features could allow the briefing media to:
  - keep passenger's attention engaged for longer times
  - make safety instructions more appealing to passengers
  - adapt presentation to the learning needs of the single passenger
  - assess the level of understanding of each passenger, and provide him/her with personalized feedback and hints

- In tomorrow's presentation (**Wed 26 Oct, 8:00-8:30 AM**), I will explore a more advanced solution in which the passenger:
  - has more freedom of interaction with the computer-generated world
  - has to figure out the next action in a life preserver donning procedure, trying it in the touchscreen-based 3D world, and receiving contextual feedback about his/her progress

More Info

- **Project Web Site**: http://hcilab.uniud.it/aviation
- **News (follow us on):**
  - http://www.facebook.com/hcilabudine
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