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A comparative study of aviation safety briefing media: card, video, and video with interactive controls

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ABSTRACT

Passengers' safety knowledge is a key factor in determining the chance of surviving any life- or injury-threatening situation that could occur in civil aviation. Aviation regulations require airlines to provide safety briefings to inform passengers of safety procedures on board. The safety briefing card and the safety briefing video are the two media that airlines routinely employ on board to this purpose. Unfortunately, research on aviation safety briefing media has cast serious doubts about their efficacy, urging researchers to better understand what makes safety briefing media effective as well as improving their effectiveness. This paper contributes to such goals in two different ways. First, it proposes the introduction of interactive technology into aviation safety briefings for improving their effectiveness. Second, it illustrates a controlled study that compares the effectiveness of three safety briefing media: the two briefing media that airlines currently employ on-board (safety briefing card and safety briefing video) and a safety briefing video extended with basic interactive controls. The results obtained by the study highlight a superior effectiveness of the two video media over the card media for aviation safety briefings. Moreover, the video with interactive controls produced improvements over the card in a larger number of effectiveness measures than the traditional video. The paper includes a discussion of factors that can explain the better results obtained with the video conditions, and in particular the video with interactive controls, and of possible additional extensions to increase the interactivity of aviation safety briefings.

1. Introduction

Passengers' safety knowledge is a key factor in determining passenger's response to an emergency (Chang and Liao, 2009; Muir and Thomas, 2004; Thomas, 2003; Edwards, 1990), and a knowledgeable passenger has a much better chance of surviving any life- or injury-threatening situation that could occur during passenger-carrying operations in civil aviation (FAA, 2003). For these reasons, aviation regulations require airlines to provide safety briefings to inform passengers of safety procedures on board, e.g., 14 CFR 121.571, 125.327, 135.117 (FAA, 2014). The safety briefing card and the safety briefing video are the two media that airlines routinely employ on board to this purpose. Unfortunately, interviews of aircraft accident survivors (NTSB, 2000; Chang and Yang, 2011) as well as accident reports, e.g. (NTSB, 2010), have cast serious doubts about the effectiveness of current safety briefing media for passengers, urging researchers to better understand what makes safety briefing media effective as well as improving the effectiveness of current media.

In particular, two major issues have been raised. One is lack of attention to safety briefings in a large proportion of the flying public. Indeed, passengers' surveys (Corbett and McLean, 2007) as well as accident investigations (NTSB, 2000, 2010) report that

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passengers who attend to safety information on-board are between 30% and 40%. The other major issue is lack of comprehension and recall of the safety information provided by the media. Studies with participants who were asked to examine safety briefing cards (Corbett and McLean, 2007; Corbett et al., 2008; Weed et al., 2013) showed little understanding of the received safety information. Studies with participants who were asked to watch safety briefing videos (Seneviratne and Molesworth, 2015; Tehrani and Molesworth, 2015) reported "alarming" recall rates of the received safety information, and called for improvements of how safety information is delivered to passengers to make it more understandable and memorable.

This paper focuses on comprehension and recall issues, and has two main goals. First, we want to propose and implement a possible improvement – the addition of interactive controls - to safety briefing videos. Although the introduction of interactive technologies into aviation safety education has been advocated since 2004 (Cosper and McLean, 2004), to the best of our knowledge, no work exists on making aviation safety briefing videos interactive. Our second goal is to compare the two media currently employed on-board by airlines (i.e., the safety briefing card and the safety briefing video) and the proposed interactive safety briefing video, in a controlled study that considers different aspects of effectiveness.

1.1. Introducing interactive controls in aviation safety briefing media

The In-Flight Entertainment Systems (IFEs) mounted on the seats of an increasing number of aircraft support interactive applications (e.g., interactive movie players, simple games, questionnaires, real-time maps, …), and could provide a first infrastructural opportunity to extend safety briefing videos with interactive features. Unfortunately, such interactive IFEs are typically not available on low-cost carriers, and are more generally available only on selected long-haul flights with any carrier.

A complementary, more promising opportunity is to take advantage of widespread Personal Electronic Devices (PED), such as smartphones and tablets, that most passengers bring on-board. This is not problematic anymore for aviation regulators as the latest regulatory policies (FAA, 2015; EASA, 2014) allow PED use by passengers to all phases of flight. The current trend in the airline industry towards providing wireless connectivity on any aircraft further encourages passengers to use their PED on-board, and the latest surveys clearly highlight passengers' demand of having the same connectivity in the air as on the ground (IATA, 2016). Moreover, PED open up additional, new opportunities for delivering the safety briefings, e.g. the interactive content could be sent to the passenger together with electronic tickets or boarding passes that they already receive on their PED before the flight, or it can be accessed wirelessly after boarding through the airline connectivity services. In the first case, the passenger can even start using the interactive briefings before boarding the aircraft. In both cases, PED make it possible to use the briefings more discreetly than IFEs, allowing a passenger to focus on the content without worrying about being watched by others. Finally, interactive safety briefings could also allow airlines to introduce incentives for encouraging passengers to attend to safety information. For example, passengers could be offered frequent flyer points for attending to safety briefings, and the interactive safety briefing could check that the passenger has gone through all the steps of the procedures, and possibly ask to answer a final comprehension test, before granting the incentive miles.

To design the interactive safety briefing proposed in this paper, we started by considering findings that emerge from research in the learning and instruction community. First, provided that they are intuitive to use, adding basic interactive controls (stopping, restarting, replaying) to a video presentation should improve learning of *procedural skills* (Schwan and Riempp, 2004; Hasler et al., 2007; Merkt et al., 2011) with respect to a traditional non-interactive video or to a printed presentation of procedures. This consideration is based on the results of studies concerning concrete procedures that require motor actions such as tying nautical knots (Schwan and Riempp, 2004) or creating origami paper folds (Shyu and Brown, 1995). In addition, in giving recipients more control over the inevitably transient information of videos, we considered the fact that a segmentation of information into small, discrete segments (instead of a steady flow of information) has been shown to be beneficial for learning (Mayer and Chandler, 2001; Hasler et al., 2007). We thus considered each action in each safety procedure illustrated by the briefing as an individual segment. These considerations focused the design of the interactive controls we added to the safety briefing video as follows: after the character in the video presents a segment (a single action) of a safety procedure, the presentation stops automatically, and the user has to touch the screen to proceed with the next segment. This allows the user to adjust the pace of the presentation to his/her individual cognitive needs, supporting self-regulated information processing (Merkt et al., 2011). Then, when the presentation of a safety procedure is complete, our interactive safety briefing offers the user the choice of replaying that procedure from its start or continue to the next procedure (see Fig.1).

Second, a video depiction of a human carrying out a procedure is more effective if the boundaries of each action are made more salient, because they facilitate the process of cognitively segmenting the flow of activity into intelligible units (Newtson and Engquist, 1976; Schwan et al., 2000). Moreover, research on animations has shown that cueing can help the recipient handle transient information by highlighting relevant aspects of a presentation (e.g. de Koning et al., 2007). For these reasons, after the character in our interactive safety briefing presents a segment of a procedure, not only the presentation stops automatically, but we add a graphical cue that highlights what is the contextually important point of interest the user should focus his/her attention on (Figs. 2 and 3).

Third, on devices that use a touchscreen for interaction, such as PED and recent IFEs, dragging gestures - instead of simple taps - may positively influence understanding of content (Dube and McEwen, 2015). This recent finding focused the way we designed the interaction that allows users to proceed to the next segment of a procedure. Instead of simply tapping the cue on the screen, the user has to perform a dragging gesture that is contextually connected to the next action in the procedure. For example, if the audio comment in the video has just said that the passenger has to put the oxygen mask on his/her face, the gesture will require to touch and drag the oxygen mask from its position on the screen towards the face of the character on the screen. The graphical cue we add to the video highlights the area from which the gesture starts, and the direction of the gesture: Fig. 3 shows an example in which the