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Better passenger boarding experience by light guiding

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Abstract The passenger experience while boarding an airplane can be low. To improve the experience a light guiding system was developed which allocates and displays the passengers luggage space in the overhead bin. The allocated space is guided by a light strip in front of the display that blinks when a passenger comes close to their allocated luggage space. A test was done with groups of 18 passengers to compare the traditional way of boarding with the new way of boarding and the experience was significantly improved. The system has potential, but more studies with larger groups and in a real flight are needed to check if this effect is still there.

1. Introduction

Almost all of us might recognize that boarding in an airplane and finding a spot for your hand luggage might be a bad experience. The comfort in an airplane is lowest when boarding and during cruise flight according to a study by Bouwens et al. (2017). This is shown in figure 1. This is probably because of the stress finding your seat, placing the hand luggage and the uncertainty of being able to place the hand luggage in the overhead bin. According to Broek (2015), none of the narrow body airplanes have sufficient capacity to stow a hand luggage trolley for every passenger on a fully booked flight. Besides, when passengers place the luggage randomly in the bins near their seat, they most likely do not make optimal use of the available space in the bins. For this, an improved system was developed (a guiding hand luggage system: GHL-System) and a user test was performed to compare the new system with the current boarding process.

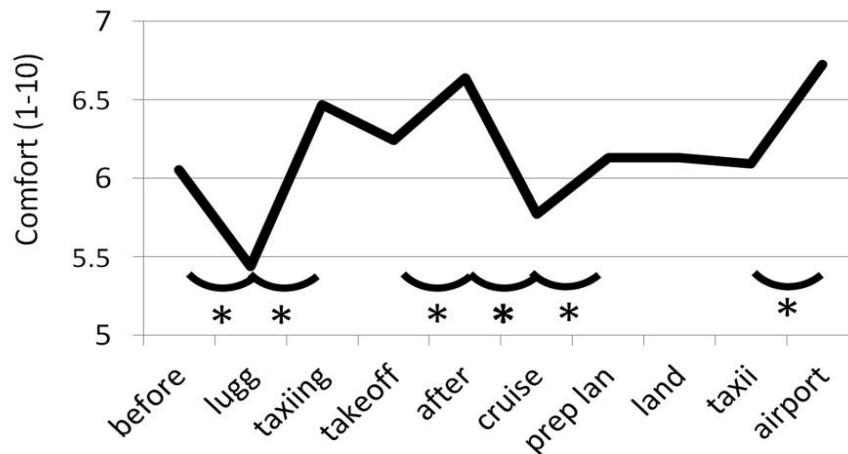


Figure 1. The comfort on a scale from 1-10 in the different phases in the flight. * means significantly different from the phase next to the phaseant hand (Bouwens et al., 2017)

1.1. Research Question

The goal of the guiding hand luggage system is to improve the overall boarding experience. The main question is whether this system has a significant effect on passenger experience. Therefore, the following research question is formulated:

Does the developed Guiding Hand Luggage System influence boarding experience?

2. Method and Materials

1.2. Guiding Hand Luggage System

A GHL-System was developed that guides passengers in placing the hand luggage. It has lights that increase the intensity when a passenger comes closer to the place where the hand luggage should be placed. When the hand luggage is placed correct in the bin a green light lights up and when it is place the wrong way it will turn into red. The bins also consist of flexible screens that show the seat number that is on the ticket of the passenger (see figure 2).

Before being able to find the best spot and the optimal loading of the bins, passengers are asked to provide the airline with their hand luggage dimensions while booking their ticket or checking in (on the application, the website, or at the check-in desk). Passengers who provide the airline with this information can/will board first. An algorithm calculates the optimal hand luggage division in the overhead bins to make these fit. Passengers, for whom the luggage will not fit, will be asked to check-in their hand luggage.



Figure 2. Luggage divisions including a light strip, an outline, seat number, and icon.

1.3. Test

Two groups of 18 participants were asked to board a Boeing 737 test fuselage on the campus of Delft University of Technology (Delft, the Netherlands) on two occasions; ‘regular’ (i.e., boarding without the guiding system, and according to a ‘new’ boarding process using the guiding (including pre-reserved luggage spots for the passengers, guiding light effects and both visual, and textual luggage divisions in the overhead bins). Participants were assigned a seat out of four rows of six seats, with corresponding overhead lockers located exactly above the seats on each side. Next to the two groups who boarded the plane twice, a third group participated as a control group and boarded twice according to the regular boarding process to determine a possible learning effect. The passengers carried luggage. Twelve normal suitcases, 2 small suitcases, 4 backpacks and 7 jackets were used as luggage, which was the same in all three trials. The participants were either student or staff from TU Delft. Different nationalities were represented with participants coming from India (41.5%), The Netherlands (24.5%), Spain (7.5%), Indonesia (5.7%), the USA (5.7%), Great-Britain (3.8%), Iran (3.8%), Italy (3.8%), Finland (1.9%), and South Korea (1.9%). Before the test an informed consent was given and after each boarding round, all participants were given a questionnaire and a pencil. Questions were asked regarding feeling stressful, rushed etc. using a 7 point Likert scale (Likert, 1932). Differences between the groups were tested using the Wilcoxon signed rank test. (p<0.05) (SPSS, 2013).

3. Results & Discussion

Table 1 shows that there is a significant difference in the rating of positive experience (p=0.048), easy to board (p=0.020), easy to store luggage (p=0.017), and fast boarding (p=.024). However, in comparison to regular boarding, the guided boarding showed a significant difference (p<0.01) on all examined criteria. In other words, participants favoured all the tested aspects of the guided boarding experience compared with regular boarding.

Table 1: Values for the control group (first boarding vs second boarding n=17) and Group 2 & 3 (old vs new, n=36). Significant differences were calculated using the Wilcoxon signed rank test.

| | <i>Stressful</i> | <i>Rushed</i> | <i>Positive Experience</i> | <i>Easy to Board</i> | <i>Fast Boarding</i> | <i>Long Queue</i> | <i>Easy to store luggage</i> | <i>Easy to Find seat</i> |
|--|------------------|---------------|----------------------------|----------------------|----------------------|-------------------|------------------------------|--------------------------|
| Significance Control group (1 st boarding vs 2 nd) (n=17) | 0.192 | 0.127 | 0.048* | 0.020* | 0.024* | 0.131 | 0.017* | 0.066 |
| Significance Group 2 & 3 (old vs new) (n=36) | <0.001* | <0.001* | <0.001* | <0.001* | <0.001* | 0.001* | <0.001* | 0.013* |

This study showed that the guiding system has potential as the passenger experience while boarding is better with it. This study showed that the guiding system has potential as the passenger experience while boarding is better with it. A more extensive description can be found in a paper of Vendel et al.(2019).

4. Limitations

Drawbacks of kind of studies is that there is always a learning effect. The second time boarding is often faster (Coppens et al., 2018). Also, in a real situation the stress could be higher as this is not a real flight. On the other hand it is a within subject design, which means that both situation are not in a real flight. Another limitation could be that the study was done with groups of 18 participants and common flights have more passengers. The effect could be even larger on a larger scale or it could be more confusing with more peoples. Therefore, it is advised to study this with a complete aircraft with 150-180 passengers as well in the future.

5. Conclusion

The light guiding system did convincingly improve the passenger experience during boarding. However, future research is need in real flights and with larger study groups.

6. Acknowledgements

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