Air travel during pandemic context: Designing for a better Economy Class flight experience

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ABSTRACT

This work focuses on the aeronautical industry during the pandemic context experienced recently. The Economy Class represents the largest capacity for carrying passengers. Therefore, the challenge of improving physical comfort and safety in this place is the goal of this project.

The world of air travel has been under threat since the beginning of the COVID-19 pandemic and may never be the same again. The idea of spending time inside a closed aircraft with low social distance is not pleasant. Flying in this context is undeniably hard, taking into account all the understandable ambiguity and stress surrounding passenger's health and safety. Hence, the mission to redefine what travel can and should be in this new era is born.

The following investigation gives rise to a proposal that aims to reduce the infection's possibility on board. After approaching the knowledge through state of the art, surveys were structured, supported by direct and indirect posture and behavior observation inside the airplane. Based on the first inquiry results were made some concept proposals. Later, the previous concepts gave rise to study models and then, to prototypes that allowed a real project validation. The objects were first tested by a virtual survey, then in a physical seat in isolation, and finally during an actual flight context. Based on the results of this mixed, interventionist, and non-interventionist methodology of quantitative character, the author designed two iterations and a set of future search recommendations.

The investigation results were considered conclusive. From a theoretical context, it was possible to identify a design work opportunity for this sector, supported by the first inquiry – which argues that there are ergonomic needs and that safety feeling is relatively low. Regarding the practical component, it was possible to verify an increase in comfort level using the proposed product compared to the original airplane seat. For future research, the inflatable materials exploration, systems with memory foam, and reactive using fabrics would contribute to the project enrichment.

KEYWORDS

Air travel 1, Pandemic 2, Product Design 3, Economy Class 4

Introduction

Most airplanes recycle 25 to 30% of the cabin air, the other 70% are evacuated to the sea every two minutes, which means that there is fresh air at the cabin every two to five minutes, depending on the size of the aircraft. Therefore, Freedman states that air circulation in an airplane is better than in an office building and even in homes, as it is changed more times per hour. However, air filtration is just one piece of the puzzle and is not enough to prevent contagion, said Saskia Popescu, infection prevention epidemiologist in Arizona. Distancing and wearing masks are crucial to mitigate the

risk, whether during a flight or in any other situation. At the beginning of the year, when it became known for the first time that social distance could decrease the chances of contracting the coronavirus, many airlines began to leave their middle seats open to create more space between passengers. However, in recent months, many companies have reversed their policies and started to accommodate people in all seats, requiring the use of masks, because this would keep passengers safe.

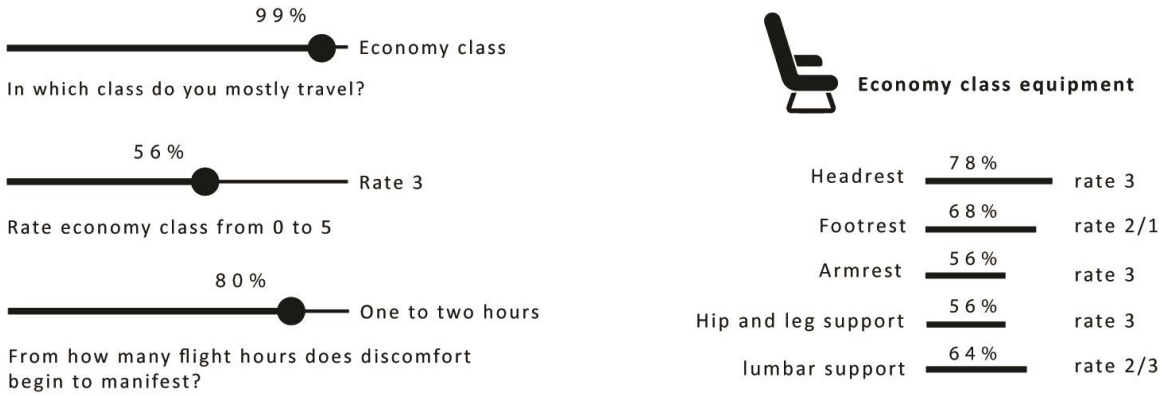
Methodology

Through the State of Art was elaborated a hypothesis, which is structured by a survey directed to those who use this transport. Direct and indirect observation of behaviors and postures, as well as case studies. Based on the results of the survey, some concepts were presented, which resulted in study models and, finally, prototypes that allowed this project validation (composed of three phases). The objects were initially tested through a virtual survey, then in airplane seat, and lastly, in a flight situation. Together with the results of a mixed, interventional, and non-interventional methodology, of a quantitative character, two iterations and a set of recommendations for future research were generated.

Research (surveys)

This approach consists of three phases. The first collects general information, such as gender, age and how often people use this transport. The second it's to classification (from 0 to 5, being 0 the worst and 5 the best) the equipment present in Economy Class (Counting that equipment may be different between airlines, the questions are from a general point of view) as we can see below at figure 1. The third pretends to collect information about the author's proposal that it was designed to improve the Economy Class flight experience.

Figure 1: First survey research results



Relatively to the second concept proposal, 68% respondents answered that could really be an improvement at the flight comfort while using these components. For component b, most respondents found it appealing (15% rated it 5 and 45% rated it 4). As for a potential improvement for the flight experience, the results were positive: 48% rated this component 4, 20% rated 5 and 30% rated 3.

The third concept proposal is composed by two options (I and II), the most voted was option I, although with only 6% difference from option II. Also during the individual classification of each option, option I revealed more promising results. Relatively to the potential protection degree: 54%

respondents rated 4 for option I and 30% assigned the same rating for option II. 73% rated 4 to option I for potential contribution to privacy on board improvement and 62% to option II. Finally, 65% respondent prefered to receive those components already on board, while the remaining 34% prefered to have their personal kit, for hygiene and environmental issues.

Concept proposals

Main characteristics: practicality, protection and privacy
First proposal name: Kit Comfort
Total proposal's number: 3

Table 1: Concept proposals

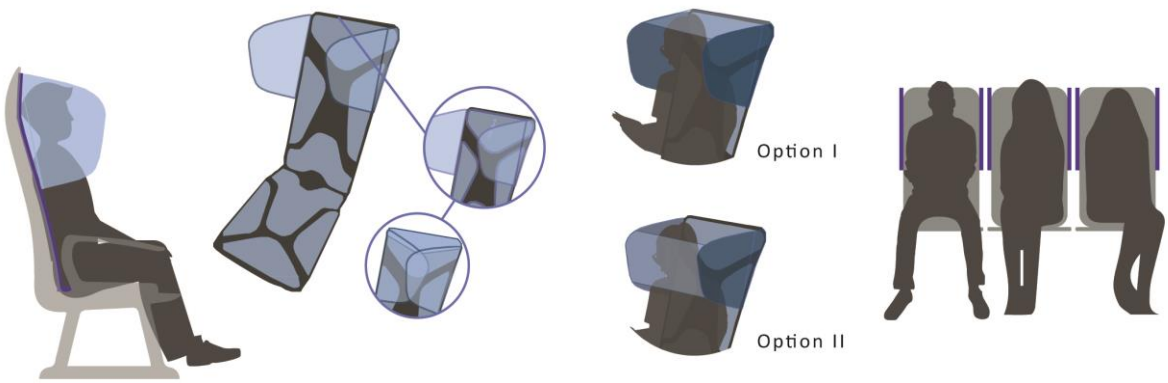
Concept	Components	Advantages	Disadvantages
1.	a) Hood d) Blanket e) Headphones	+ Privacy/protection - Noises	.Too many objects .Strict laws .Difficult storage
2.	a) Hood b) Padded seat cover	+ Privacy/protection - Clarity Better backrest/supports	.Too many objects .Unintuitive storage
3.	c) Padded seat cover with dividers (option I and II)	+ Privacy/protection Better backrest/supports Just one object	.Above dimensions Unintuitive storage

Figure 2: Concept 2 components

a) Padded seat cover
b) Hood

a) b)

Figure 3: Concept 3 component



Both proposals were designed to make passengers feel more comfortable and experience some security face the contagion possibility.

Table 2: Tests

Test	Type	Respondents	Proposal's objects
1.	Virtual survey	101 respondent (61% between 20/30 years old)	b) Padded seat cover a) Hood
2.	Usability test (on airplane seat)	Five respondent: two Men and three women (between 165/180cm)	b) Padded seat cover a) Hood
3.	Usability field's test (two-hour flight)	One women (169cm)	b) Padded seat cover

Figure 4: Usability test on airplane seat (component b)

Summary test's results:

- A padded seat cover revealed an comfort degree increase (about to the seat);
- The material used is visually appealing but, can cause discomfort because it may be warm;
- The support that revealed needing more changes was that of the lumbar;
- Lateral headrest it's missing;
- Integrate a case for some kind of storage;
- The hood should be made of translucent material, or change its shape, to avoid the potential claustrophobia sensation.
- The hood conveys some sense of security (in the face of the contagion situation) and privacy;
- The cover for the seat is slightly larger than desired;
- It would be more practical to have one object, rather than two.
- The incorporation of two dividers may be sufficient (hood instead).
- Volunteers did not reveal any feeling of embarrassment while using the components;
- Need to create a mechanism that would ensure the padded cover to the airplane seat.
- After analysing the previously results the proposal suffered some changes, that generate the second iteration. One of the most requested points was the lateral headrest, which is why we started testing this hypothesis. Using the padded cover upper shape, we tried to incorporate two partitions that could function as a dividing element that serves as protection and privacy, as well as a side headrest. Initially, several models were created to visualize which

size was appropriate.

The lack of material's flexibility used in the second iteration caused wrinkles, which did not allow a uniform and smooth surface, (as it was on the first iteration). Although the visual aspect is not so appealing compared to the previous one, the seat cover seem to have improved, with the thickness foam increase (in the headrest and lumbar). The side dividers addition seems to have increased the privacy feeling, however, it could be slightly projected above the actual position. For those who flight together this complement can help to create a private area, if each passenger folds one of its partitions. They contain high-density foam inside and have enough strength to support the head weight (when leaning). However, it is necessary to do more tests to validate these statements, which have not been possible until now.

Conclusions:

The plane has been overtaken in terms of comfort improvement. This sector has safety standards and measures very demanding, so the challenge of designing something new for this transport also becomes more challenging. We believe that due to these requirements (as is the relationship between weight, quantity - and flight operation profitability), seats have undergone changes in their shape, especially through - thickness reduction, to placing more queues seats and consequently carry more passengers. These modifications have been stalling and, in some cases (long-haul flights), the level of comfort in Economy Class has decreased. One fact that proves this idea is the vast market of accessories bought separately to acquire more comfort while traveling (such as neck pillows, for example). In this sense, and together with the first survey responses, it was concluded that there was an opportunity to act as a designer.

Thanks to the validation phase, it was possible to obtain results that helped in the construction and future evolution of this project. Some results were: The padded cover revealed physical comfort increase, thanks to the strategically filled areas so that the passenger would feel more accommodated/cozy. And as this object covers almost the total airplane seat surface, it also proved to be interesting because it reduces the passenger's direct contact with the seat material. Regarding the material, the volunteers found it visually appealing but noted for the question of could be warm. That raised the possibility of exploring how reactive tissues can be used (ex: Anti-stains, antibacterial, odor encapsulators, thermoregulators, etc).

Shapes should not have sharp edges or rigid structures, as they can make the object dangerous in case of an accident, which ended up the idea of testing these objects with inflatable material in the future. Storage would much easier, weight and the absence of more complex mechanisms, thus making it more intuitive.

In this type of objects using manual models (at full scale) allowed a detailed analysis visualization. It was noted that the seat cover needed something to fix it to the seat, to avoid the slipping tendency. The first iteration's material easy to handle, but the second iteration material revealed characteristics such as stiffness that hindered the layout process, so it would be interesting to analyze other material's behavior.

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