

The logo for TU Delft, featuring a stylized black flame icon above the text 'TU Delft'. The 'TU' is in black, the 'U' is in blue, and 'Delft' is in black.

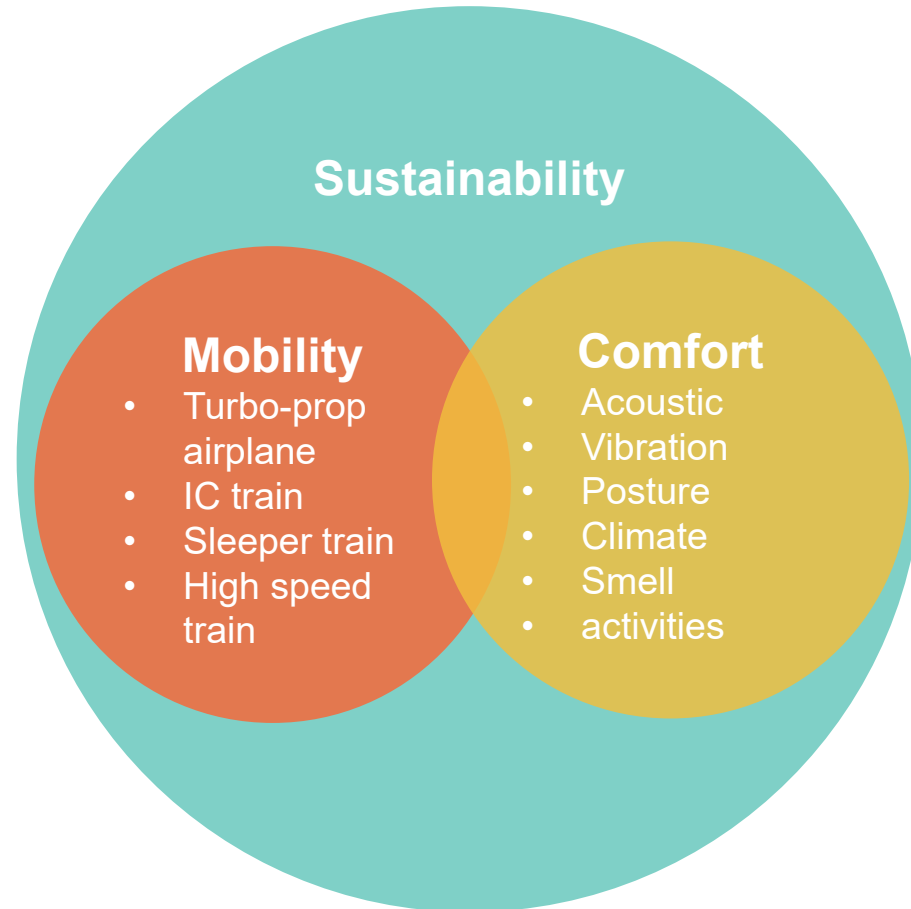
TU Delft

Acoustic experience in the cabin

Gerbera Vledder 16-03-2022



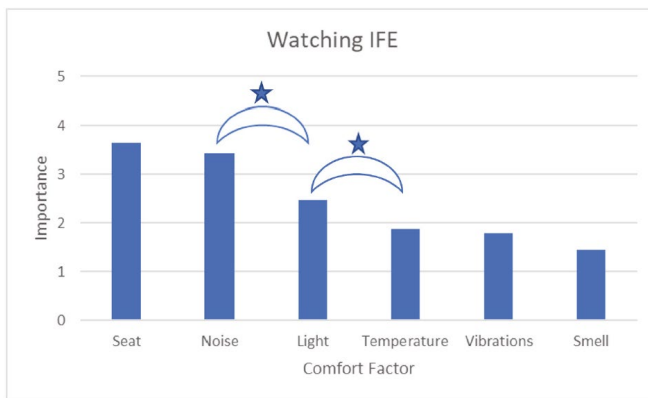
Interior Comfort in Sustainable Mobility



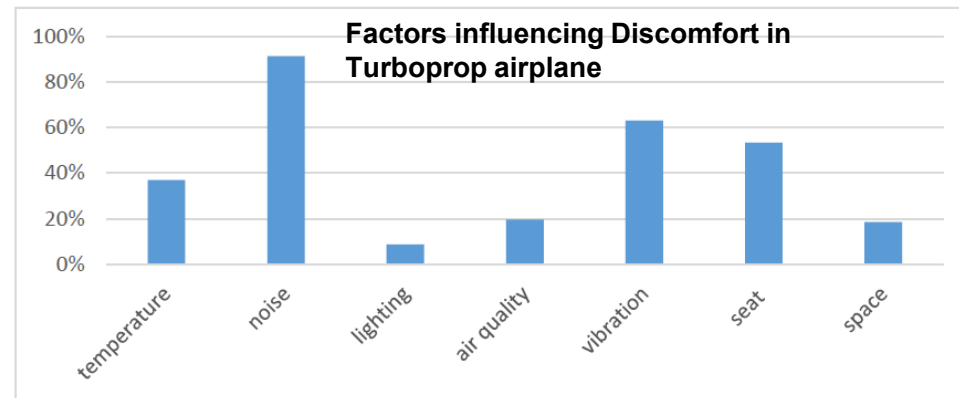
Research: Impact of noise cancelling headphones on passenger comfort in Turboprop airplanes

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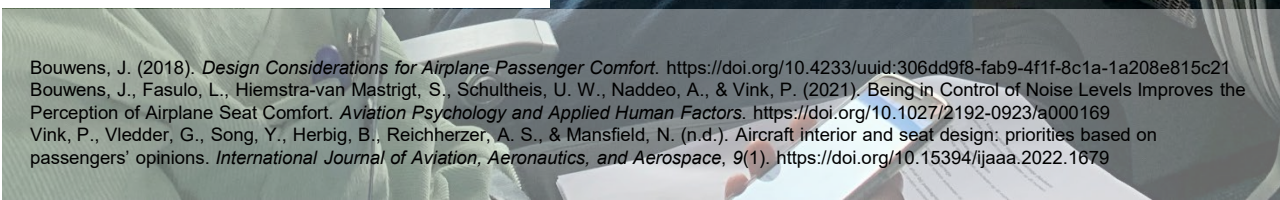
- Turbo-propeller aircraft consume less energy for short trips (e.g. at cruise 10-30 percent less).
- In turboprop aircraft the volume can reach 86dB in the back of the airplane
- Influence of noise on passenger comfort and discomfort (Bouwens, 2018)(Vink et al., 2022)
- Being in control of noise levels improves the aircraft seat comfort (Bouwens et al., 2021).



*Bouwens, 2018



*Vink et al., 2022



Bouwens, J. (2018). *Design Considerations for Airplane Passenger Comfort*. <https://doi.org/10.4233/uuid:306dd9f8-fab9-4f1f-8c1a-1a208e815c21>
 Bouwens, J., Fasulo, L., Hiemstra-van Mastriigt, S., Schultheis, U. W., Naddeo, A., & Vink, P. (2021). Being in Control of Noise Levels Improves the Perception of Airplane Seat Comfort. *Aviation Psychology and Applied Human Factors*. <https://doi.org/10.1027/2192-0923/a000169>
 Vink, P., Vledder, G., Song, Y., Herbig, B., Reichherzer, A. S., & Mansfield, N. (n.d.). Aircraft interior and seat design: priorities based on passengers' opinions. *International Journal of Aviation, Aeronautics, and Aerospace*, 9(1). <https://doi.org/10.15394/ijaaa.2022.1679>

Research objectives

- Influence of active noise cancelling headphones (ANC) on comfort of passengers in turboprop airplanes during in flight entertainment.
- Comparison of ANC headphones with earplugs.
- Influence of noise to discomfort compared to other factors like: seat comfort, light or smell.
- Comfort difference between turboprop airplane and jet engine airplane sound.
- Influence of noise and noise cancelation to willingness of passengers to fly with turboprop aircrafts



Vs.



Research setup

- +/- 24 participants
- 4 participants each time
- Passenger activity: Smartphone, book or e-reader device (without sound)
- 4x 45 min.
- 4 conditions:
 1. Jet engine sound: no earplugs or ANC headphones
 2. Turboprop sound: no earplugs or ANC headphones
 3. Turboprop sound: with ANC headphones
 4. Turboprop sound: with earplugs

** The recorded sound and volume of Comfdemo is used as basis for this test.*



Research setup

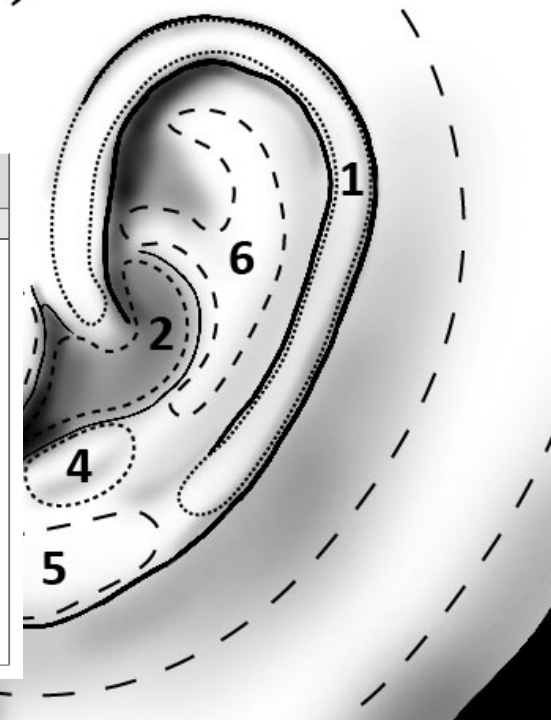
- Questionnaire (based on Comfdemo questionnaire)
- Includes:
 - Physical comfort/discomfort
 - Overall comfort
 - Relevance of certain comfort factors
 - Noise related comfort questions
 - Measure willingness to fly again with this airplane
- Recording:
 - Heart Rate Variability (HRV)
 - Research jacket: temp, CO2, Vibration, Movement tracking
 - Sound pressure level (dB)



In relation to the LOCAL BODY PART DISCOMFORT, please consider the following:

Using image below, please identify your comfort/discomfort for each body area indicated:

	Comfortable	Slightly uncomfortable	Uncomfortable	Very uncomfortable	Extremely uncomfortable
1 Head & neck	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Shoulder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Arms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Middle back	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Lower back	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Buttocks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Thighs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Knees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9 Legs & feet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Thank you!

Gerbera Vledder