SUSTAINABILITY AND COMFORT WHILE TRAVELLING

Peter Vink

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take a seat and listen to this presentation

But, take a good seat

Delft University of Technology (Industrial Design Engineering) the Netherlands

1st most cited author in *Ergonomics* (2002)

1st most cited paper in *Ergonomics* (2002)

2nd most st published author in *Applied Ergonomics* (Lifetime)

1st most cited author in *Applied Ergonomics* (2012)

1st most published author in *Applied Ergonomics* (20

1st most published author in *Applied Ergonomics* (20

https://exaly.com/author/2387407/peter-vink/journals

1st most published author in *Work* (2016)

1st most published author in *Work* (2021)

1st most published author in *Scandinavian Journal of Work, Environment & Health* (2005)

2nd most published author in *Work* (Lifetime)

Peter Vink, 5x teacher of the year + my latest book

Say out loud

Wow Peter Vink was teacher of the year

INTRODUCTION

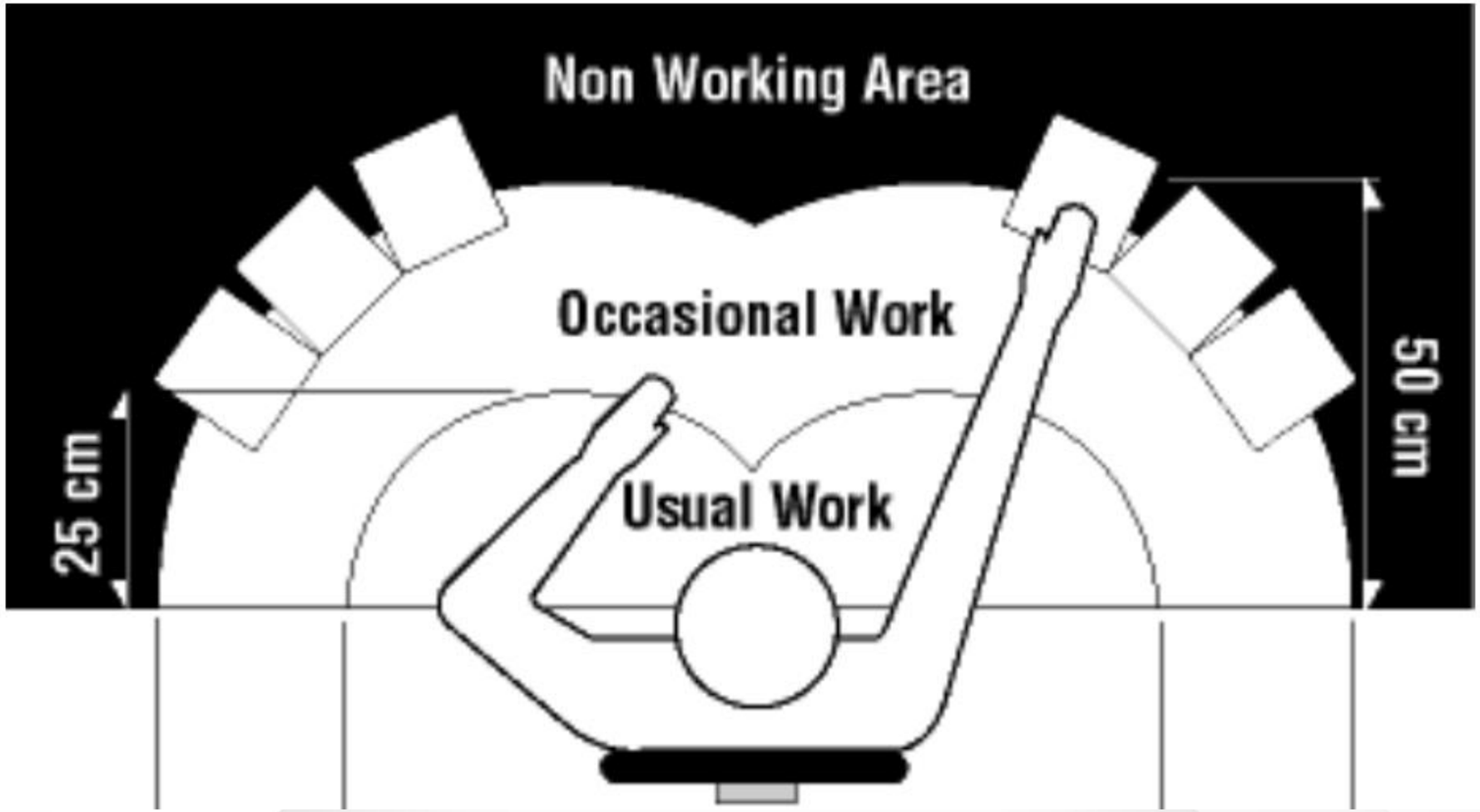
Applying ergonomics:

Better health/comfort

+

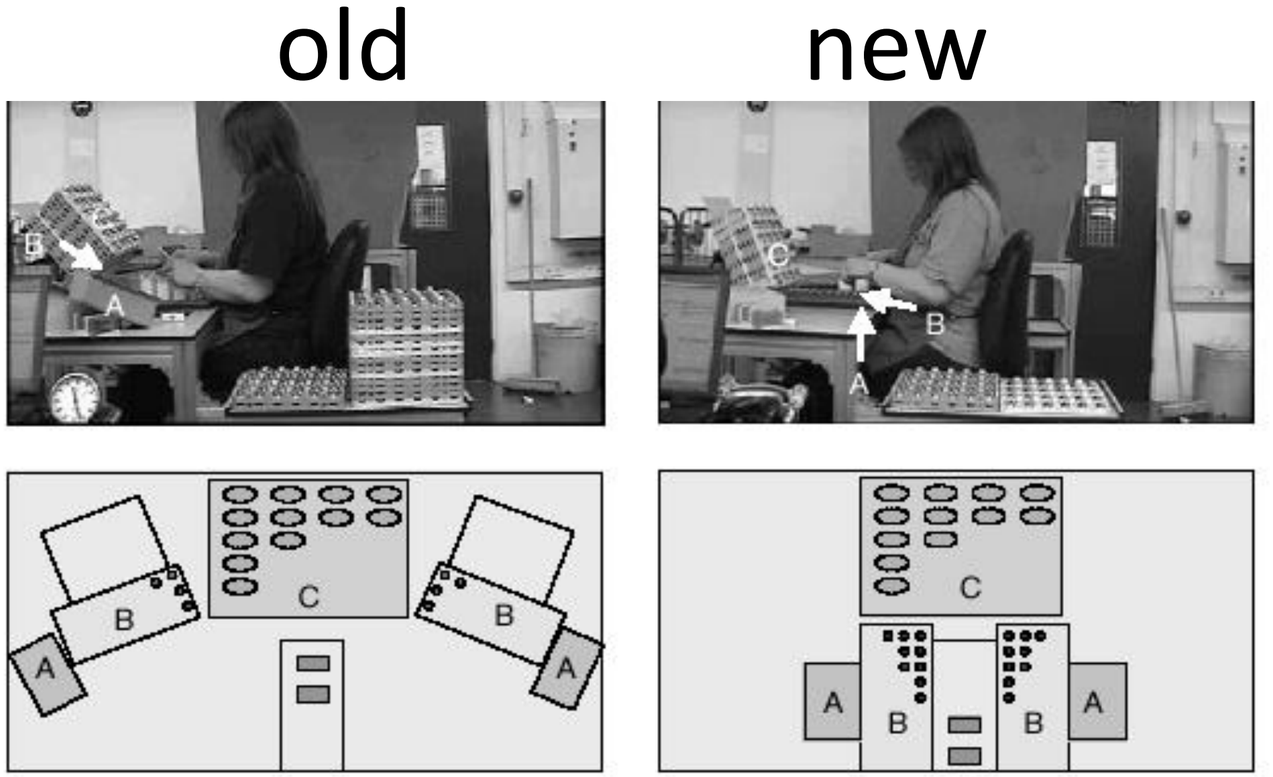
Better performance/productivity/finances

INTRODUCTION



INTRODUCTION

Looze et al., 2005



Work pace (products/min)	9.4	10.4*(+10%)
Mean discomfort	1.1	0.4*

INTRODUCTION

Applying ergonomics in travels:

Better comfort

+

Better finances (light weight)

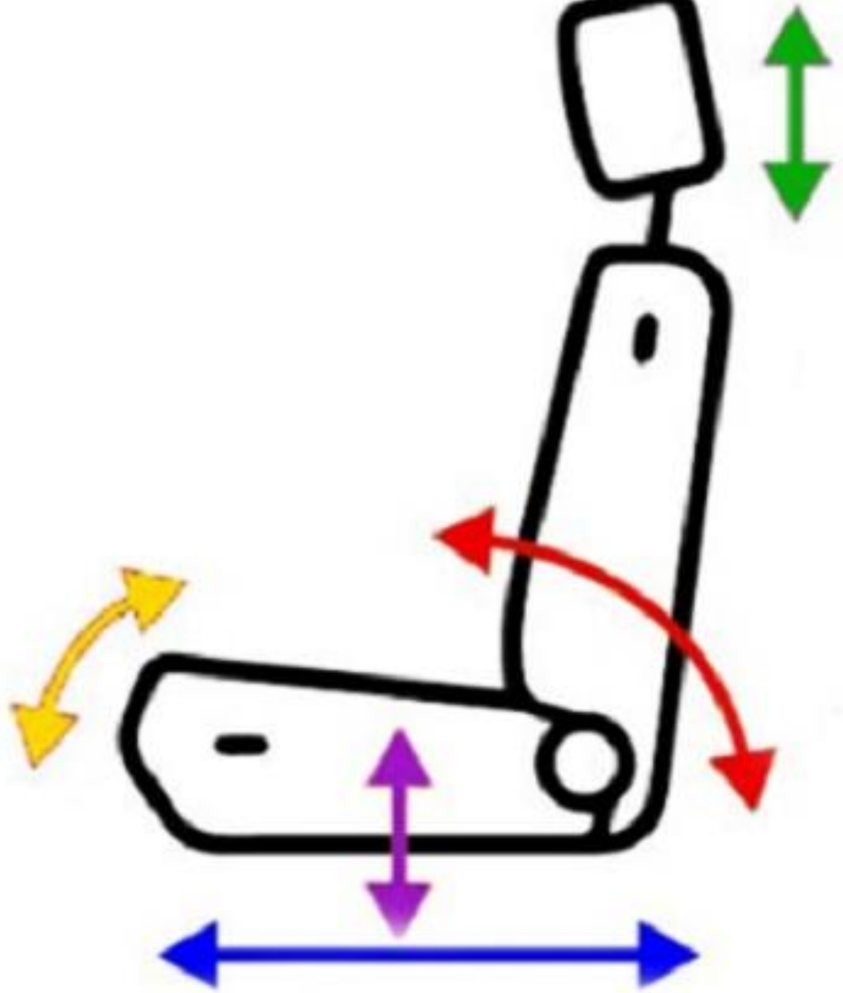
$

CONTENT

1.Light weight comfortable car seat

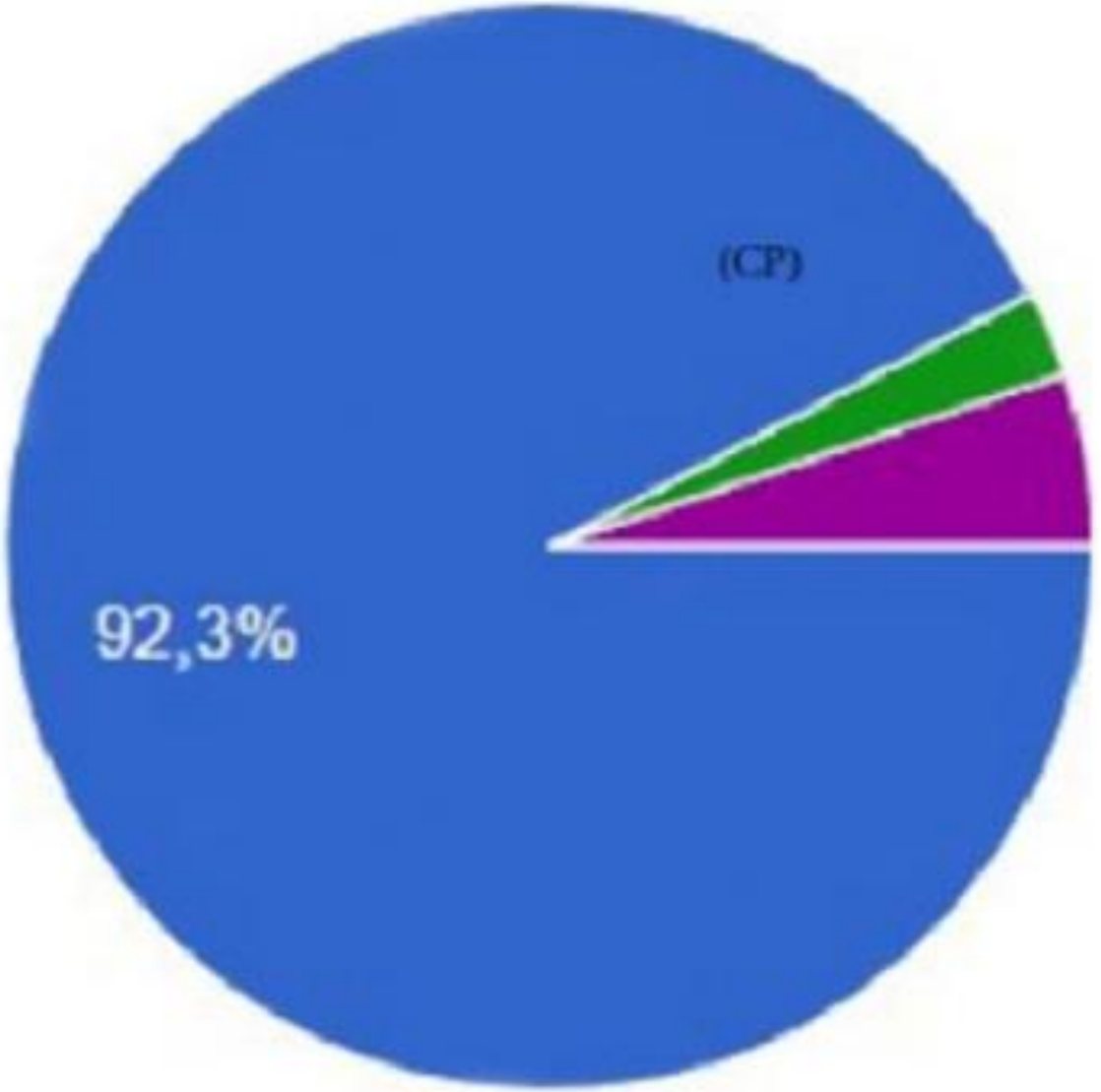
2.Zero emission comfortable long haul airplane (Flying V)

3.Towards a comfortable eco friendly propeller aircraft

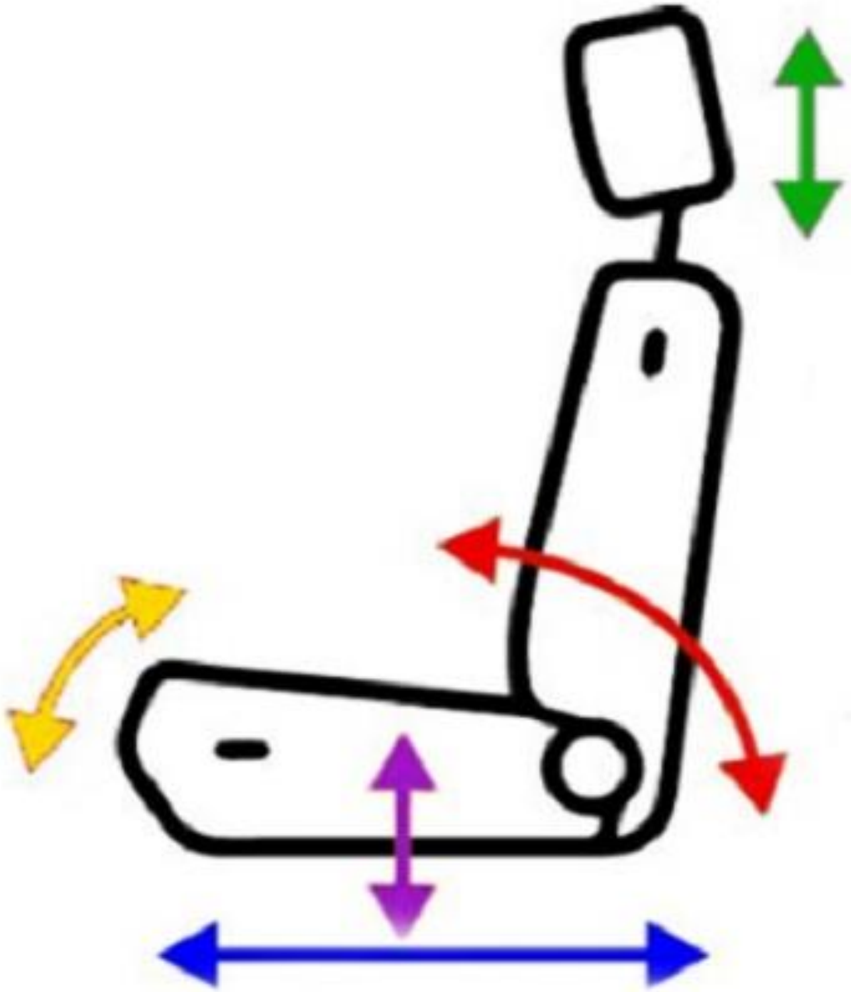


1. Sliding seat back- and forwards
2. Adjusting backrest angle
3. Adjusting seat pan angle
4. Adjusting headrest height
5. Adjusting total seat height

> What do you think is the most important adjustment possibility?

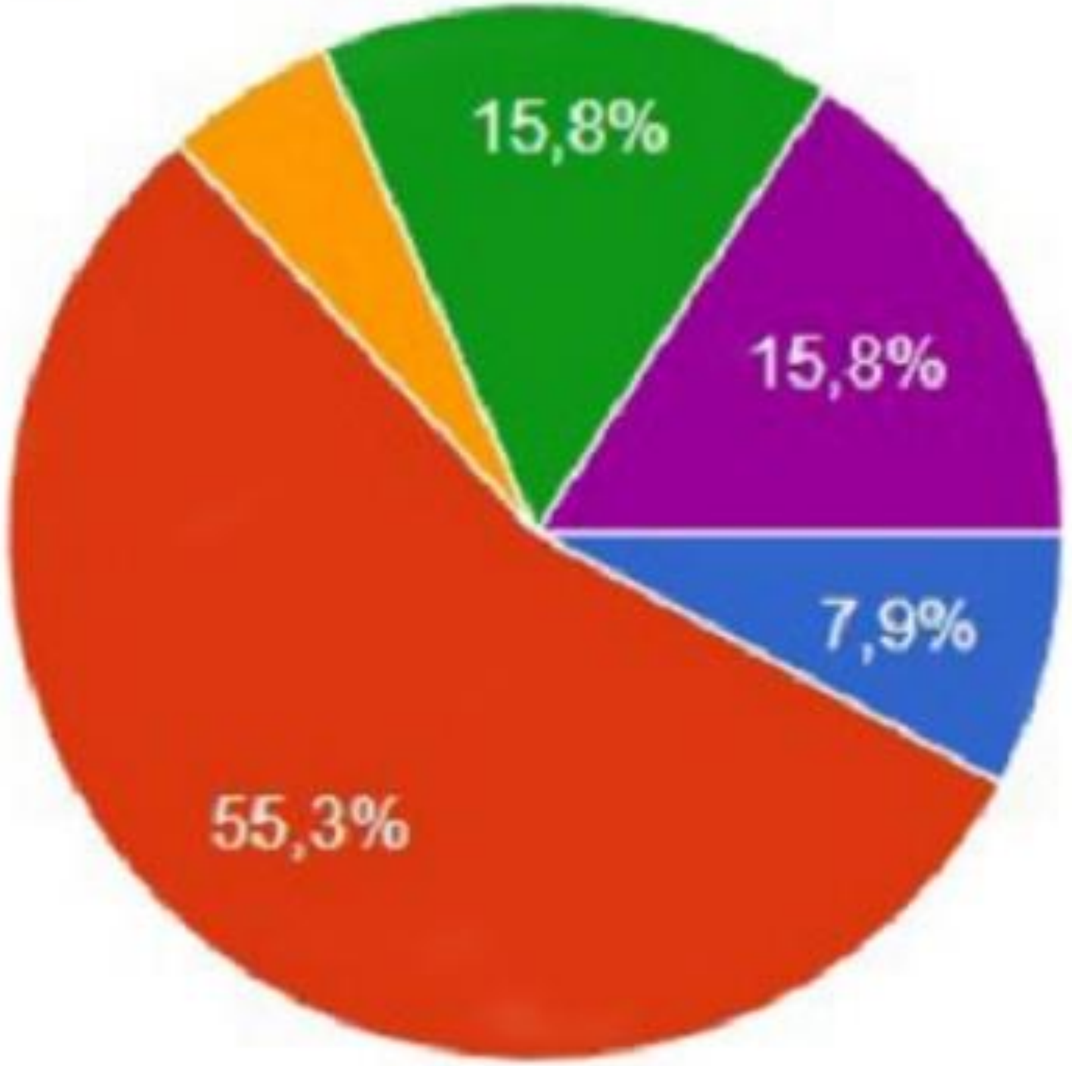


N=39



1. Sliding seat back- and forwards
2. Adjusting backrest angle
3. Adjusting seat pan angle
4. Adjusting headrest height
5. Adjusting total seat height

> What do you think is the second most important adjustment possi-bility?



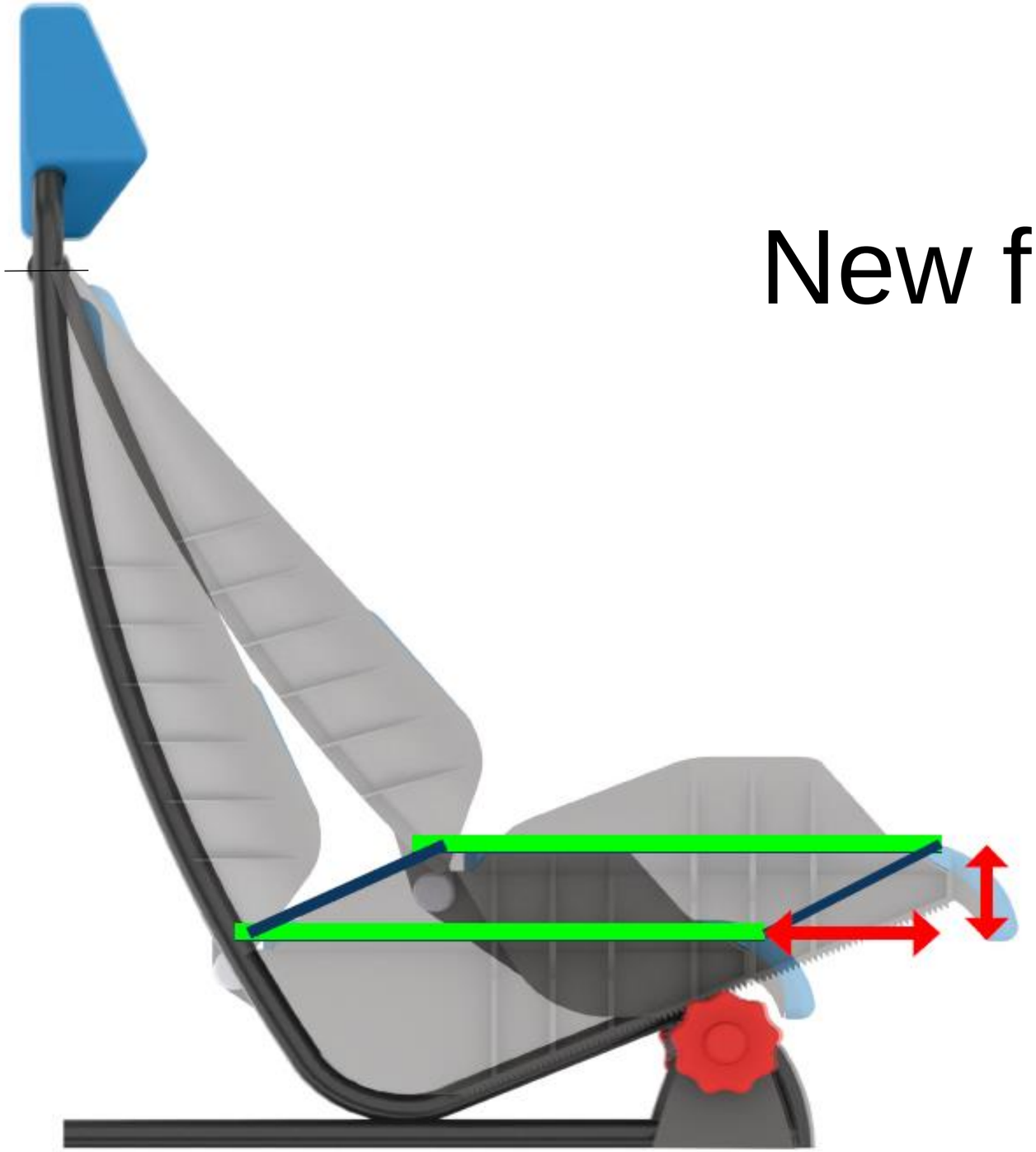
N=39

Say out loud

Car seat
back rest
recline is
important

Toyota Aygo seat:
Often sold
Can we make it
more light weight?

14 kg
Frame is 75%
of the weight



New frame developed

Frame:	5.1kg
Plastic parts:	3.3kg
Seat pan:	1.6kg
Backrest:	1.7kg
Cushioning:	0.6kg
Rack + pinion:	0.5kg
Total	9.7 kg

Van den Boom et al., 2024


It works!!!

< prototype

bench mark >

39 participants tested prototype and benchmark:
no significant differences regarding (dis)comfort, except :
-better overall comfort in bench mark (p =.00906)
-less shoulder discomfort for prototype (p = .03362).

Especially TPU in the seat pan was rated too hard related to low comfort

(TPU=more sustainable replacing foam)

Say out loud

Light weight and more shoulder comfort is possible

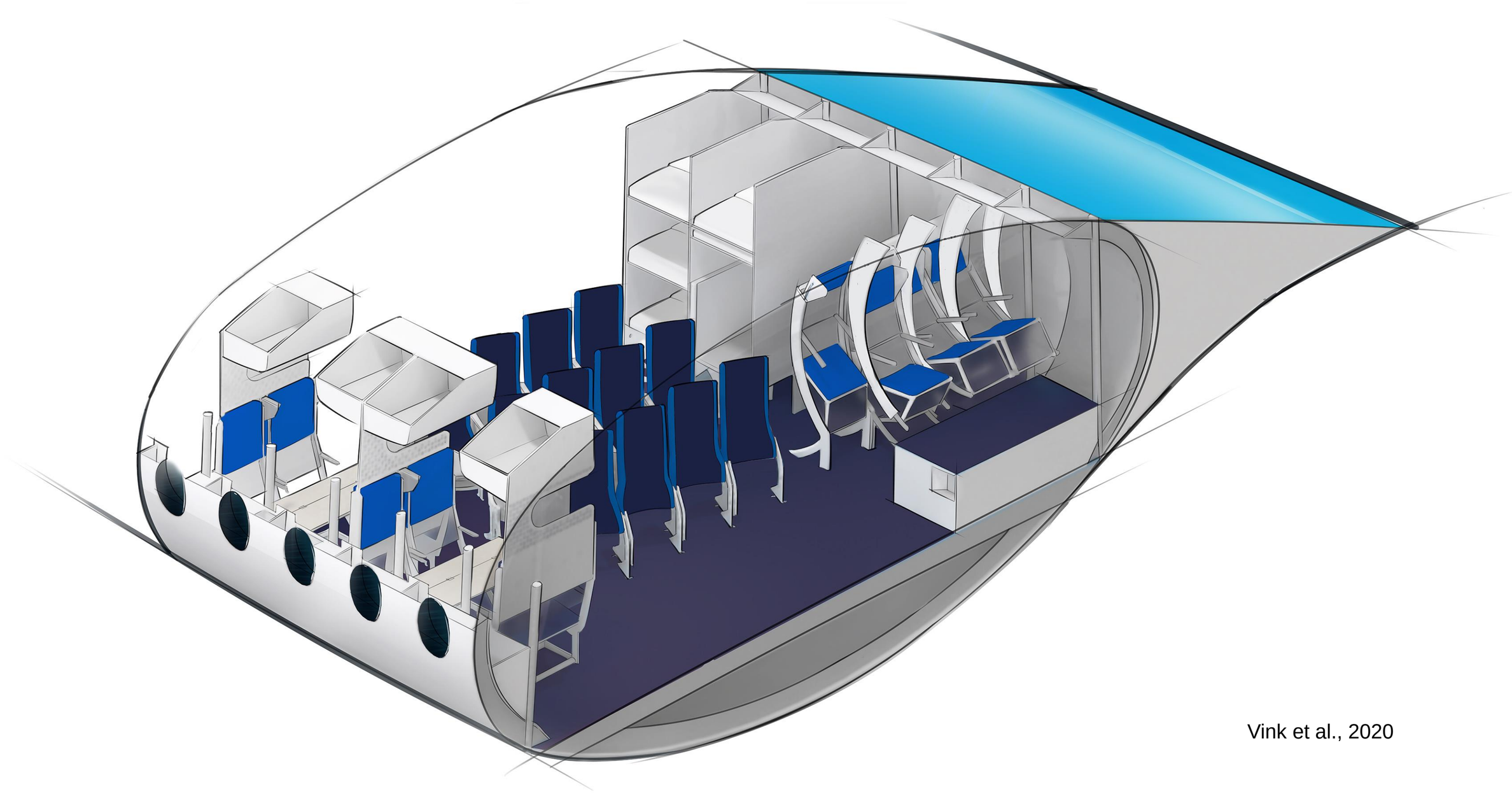

professor of the year 2018

CONTENT

1. ~~Light weight comfortable car seat~~

2. Zero emission comfortable long haul airplane (Flying V)

3. Towards a comfortable eco friendly propeller aircraft



Vink et al., 2020


AISLE C
WELCOME
TO THE
FUTURE
Chaise Longue
Economy Seat
AIRE
3D SeatMap
F FLYING
RTABLY,

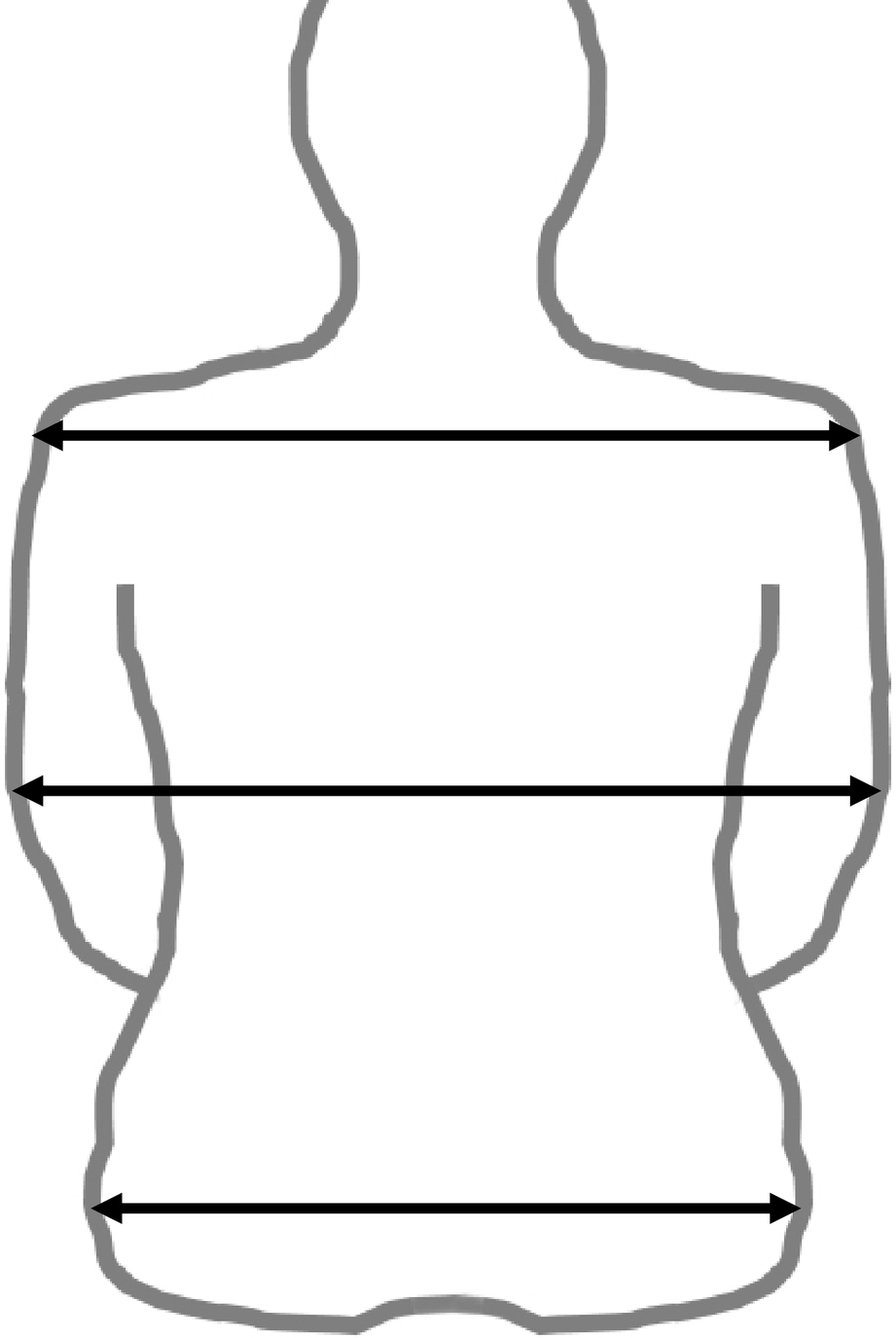
RESULTS

- no significant differences with current economy class seats,
- 59.2% would choose the Chaise Longue
- 32.7% would still prefer the current economy class seats.
- lower row comfort = 5.9 (sd 2.2), upper 6.7 (sd 1.45)

(Vicente et al., 2021)

Light weight


Pitch 28”-34”
Width 17”-18”



Aircraft seat (18” wide)

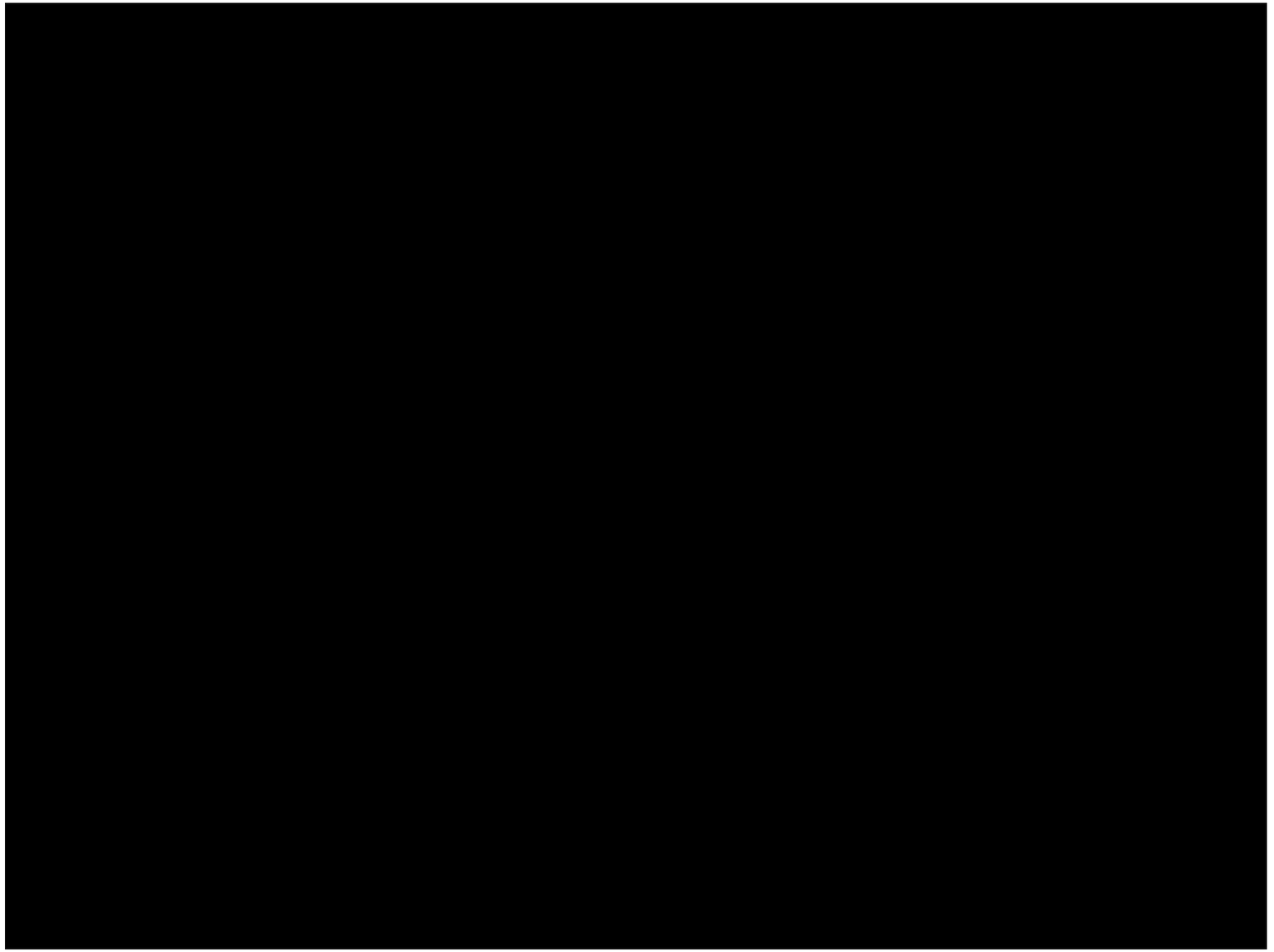
Shoulder breadth **19.5”** for p95 male

Elbow width: **19.7”** for p95 male

Hip breadth: 17.1” for p95 female

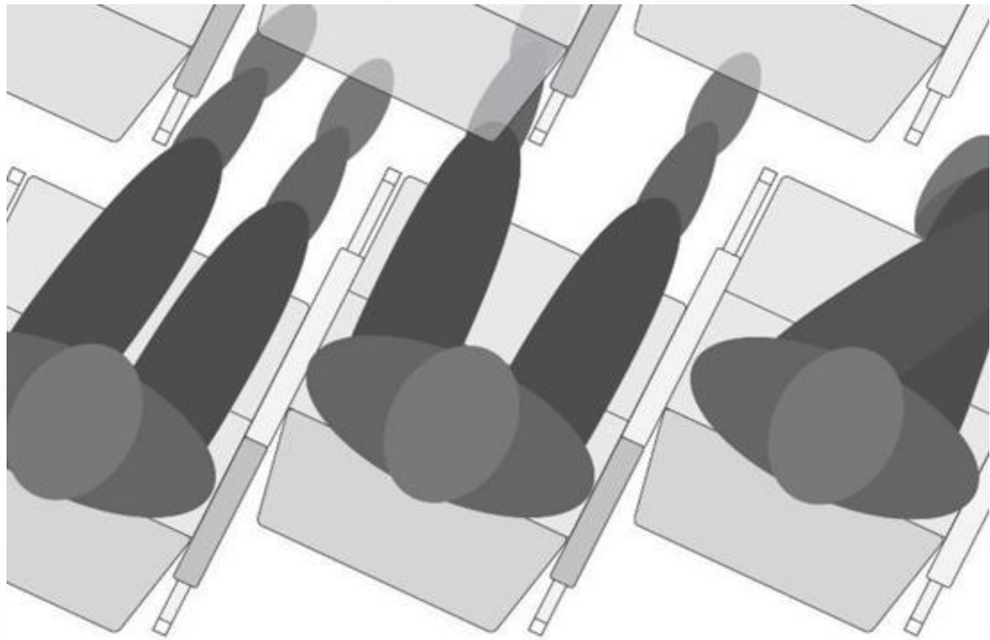
Molenbroek et al., 2017

Tests are important



TU Delft

total comfort score (1-10),
n=117, 11-67 years old, 31” pitch



Staggered	‘normal’
7 (SD=1.75)*	6.4 (SD=1.78)*

However, staggered seat hardness was still too high (Vink et al., 2021)

Say out loud

Staggered seats are more comfortable


professor of the year 2017

RESULTS

Applying ergonomics to staggered seats:

Better comfort

+

Light weight: less energy consumption

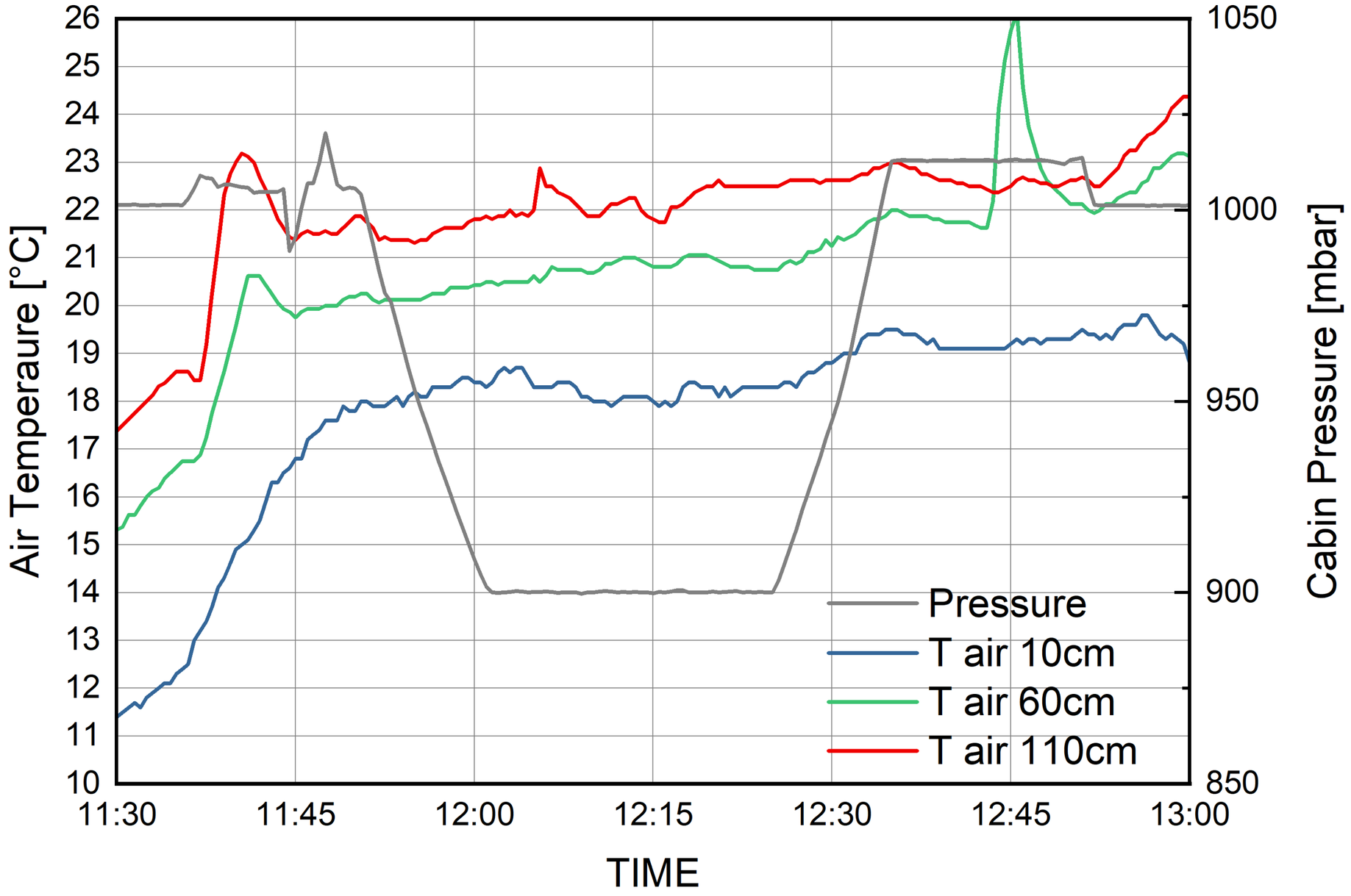
+ (Flying V 20% less drag)

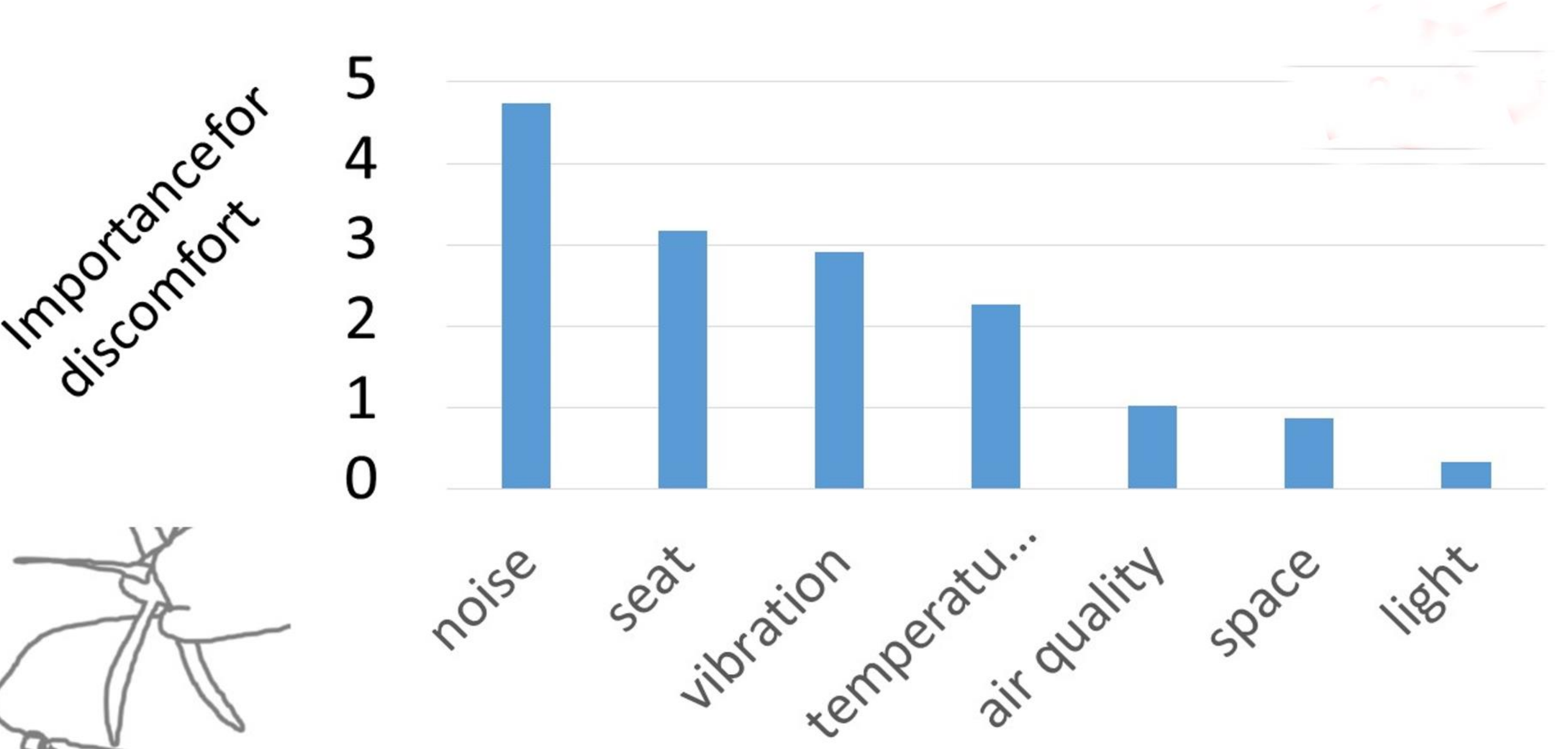
CONTENT

1. ~~Light weight comfortable car seat~~
2. ~~Zero emission comfortable long haul airplane (Flying V)~~
3. Towards a comfortable eco friendly propeller aircraft

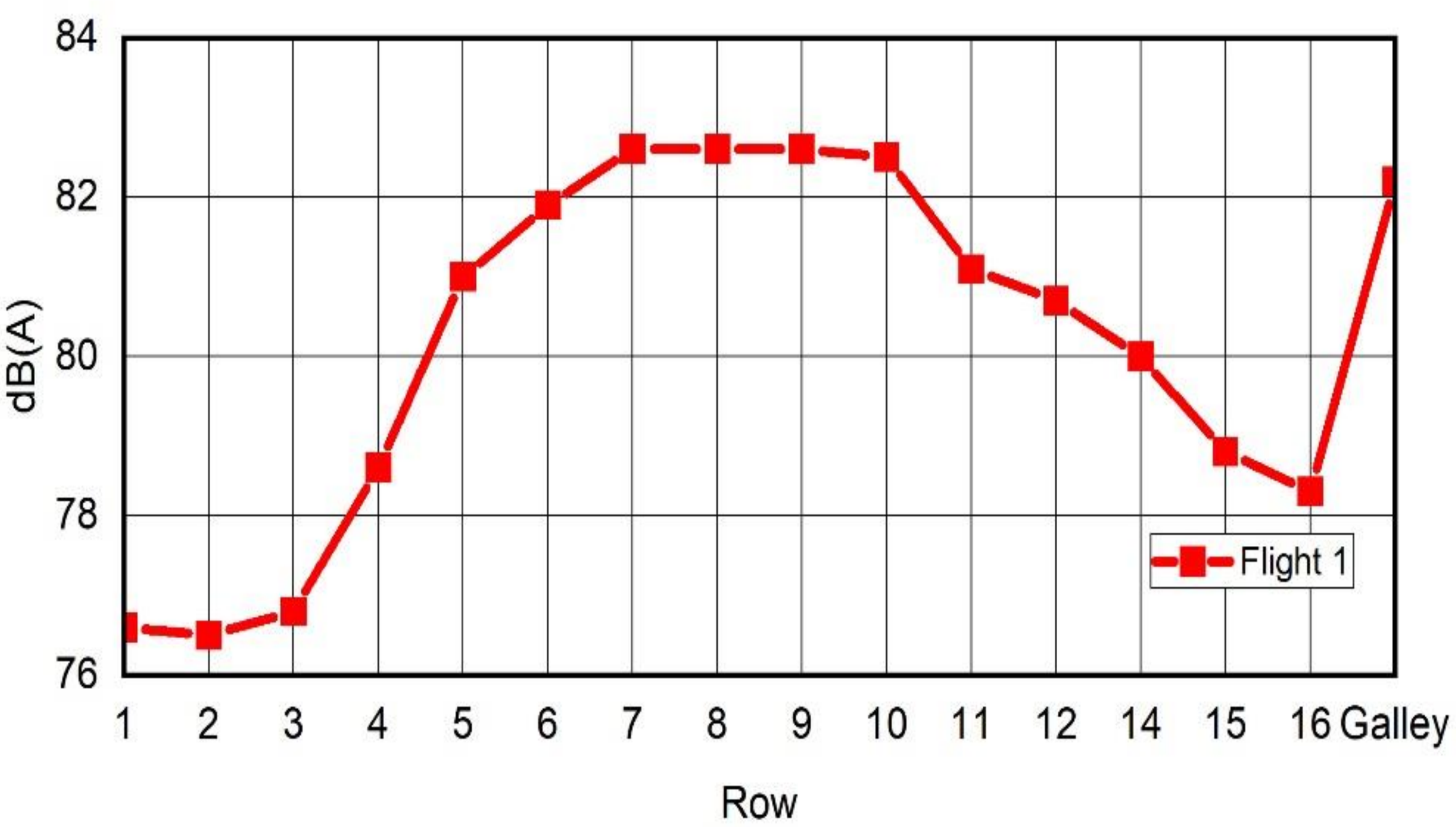
propellers for future electric airplanes


Lübeck Air

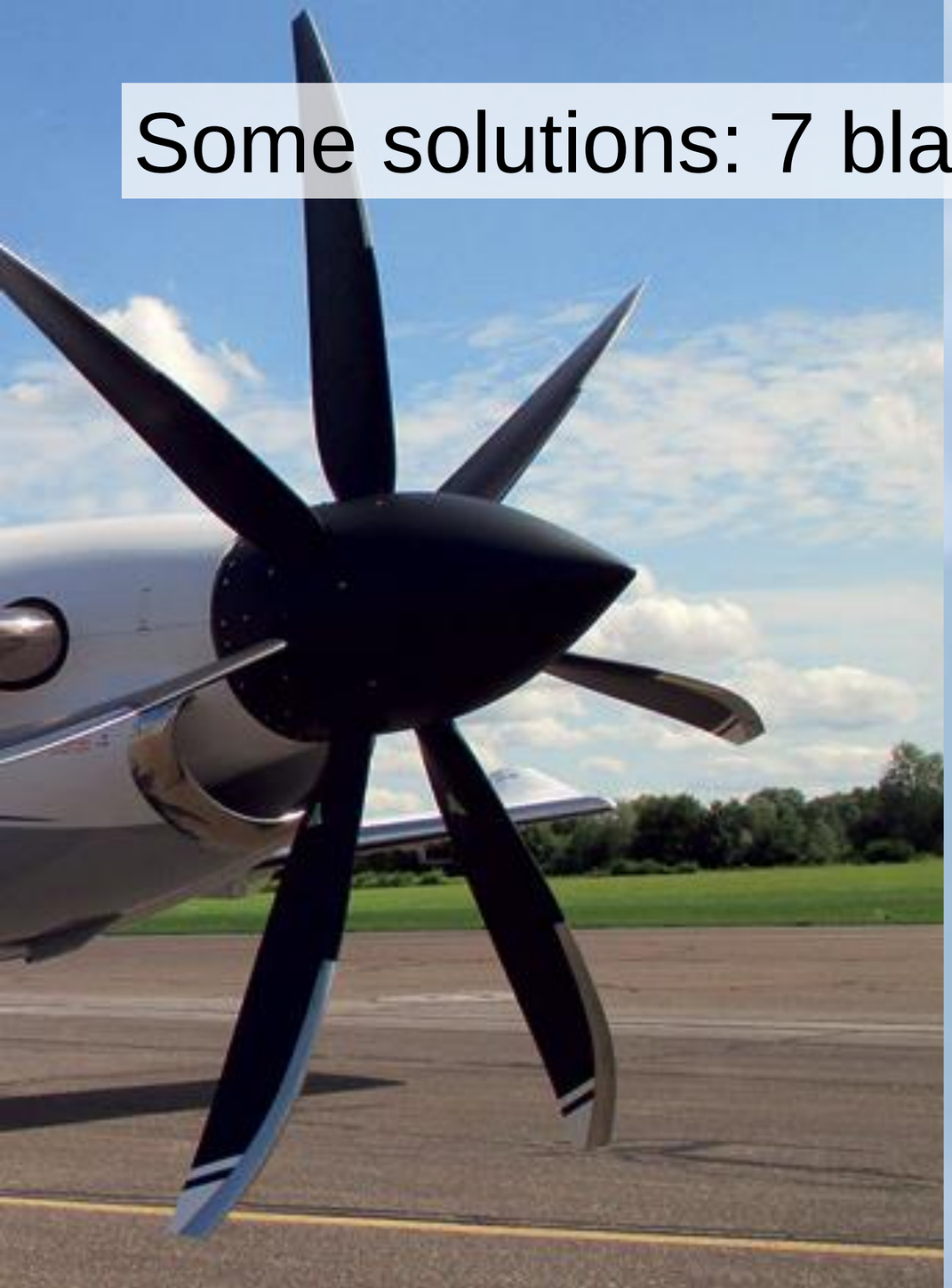

Air Temperaure [°C]
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
Cabin Pressure [mbar]
1050
1000
950
900
850
11:30
11:45
12:00
12:15
12:30
12:45
13:00
TIME
Pressure
T air 10cm
T air 60cm
T air 110cm



n=94, Vink et al., 2022

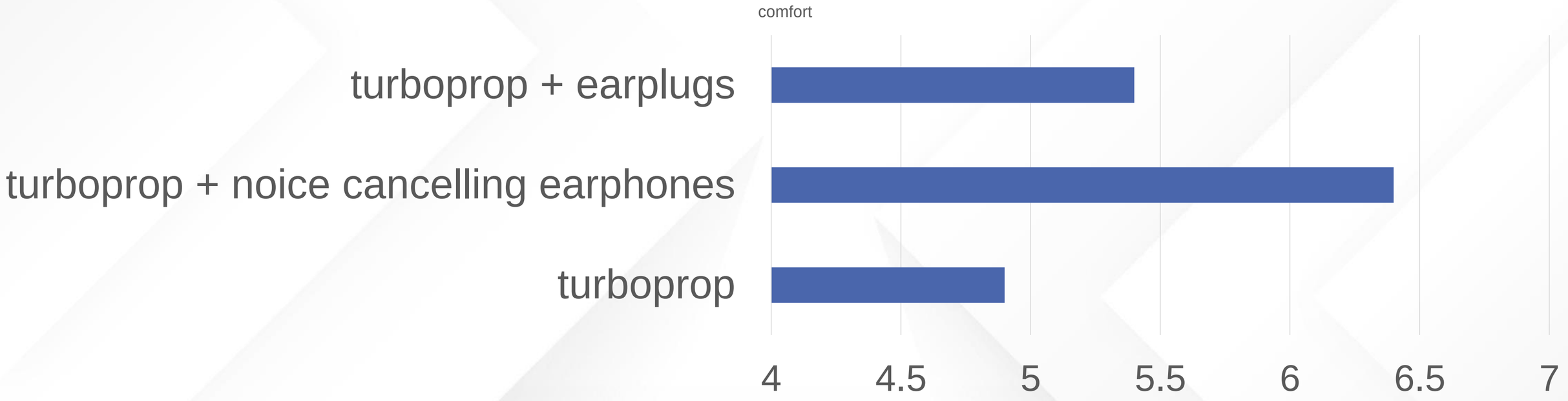

84
82
80
78
76
dB(A)
1
2
3
4
5
6
7
8
9
10
11
12
14
15
16
Galley
Row
Flight 1

Some solutions: 7 blades, noise cancelling earphone



RESULTS

Comfort (1=no comfort at all, 7=extreme comfort), n=24



Vledder et al., 2023

Say out loud

Noise should be reduced in propeller airplanes

teacher of the year 2022

RESULTS

Applying ergonomics to turboprops:

Better comfort by noise cancellation

+

Less energy consumption in propeller aircrafts

INTRODUCTION

Applying ergonomics:

Better health/comfort

+

Better performance/productivity/finances

EXAMINATION

What was the increase in work pace (products/min) when the reach envelop was improved in this presentation:
a.From 9.4 to 10.2
b.From 9.4 to 10.4

What is the second most important car seat adjustment according to end-users in this presentation
a. Head rest adjustment
b. Back rest recline

EXAMINATION

The number of different seats/beds in the flying V as presented today is
a. four
b. seven

Staggered seats compared with normal economy class seats at the same 32” pitch are experienced
a. More comfortable
b. Equal regarding comfort

EXAMINATION

The noise in a turboprop airplanes is highest
a. in the middle of the airplane
b. in the front of the airplane

Teacher of the year 2022 at the faculty of Industrial Design Engineering of the TU-Delft was:
a. Peter Vink
b. Sunisa Chaiklieng

REMEMBER

Applying ergonomics:

Better health/comfort

+

Better performance/productivity/finances


Thank you

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APOSHO38, Thailand
https://aposho2024.com/