Entwicklung von Flugzeugkabinen

Joachim Hehemann
Cabin Architecture Manager

Content

- **Cabin design principles**
- **Customer / passenger involvement**
- **Areas of concern**

- **Example: A380 Cabin concept**
  - Main dimensions
  - Reference layout
  - Cabin Operation
    - Boarding / deplaning
    - Cabin servicing concept
    - Flexibility concept

Design principles

- **All cabin items to be handled by passengers are subject to damage**
  - if they are not easy to handle,
  - if it is not evident how to handle them
  - and if they are not properly designed !

- **Weight constraints do not allow an aircraft cabin to be built as solid as home furniture. Replacement of damaged parts must be easy and quick, without removing adjacent parts or use of special tools.**

- **Safety aspects are a primary concern. The cabin must be designed in such a way, that the possibility of passenger and cabin crew injuries are limited to the greatest possible extent during normal operation and during emergency evacuation.**

- **An aircraft cabin is a workplace for the crew. An un-ergonomic environment may directly translate into low service quality.**

Design principles

- Practicality (user- orientated)
- Safety (first)
- (low) Weight (sum of all elements)
- Durability (of parts) and tenacity (of alignment)
- Maintainability, repairability and exchangability
- Flexibility in operation
- Comfort (visual, sensual, aural)
- Operational aspects (boarding time etc.)
- Handling qualities (stowage bins, systems etc.)
- Simple design

Customer / passenger involvement

- **The customer is playing and increased role in the cabin design**

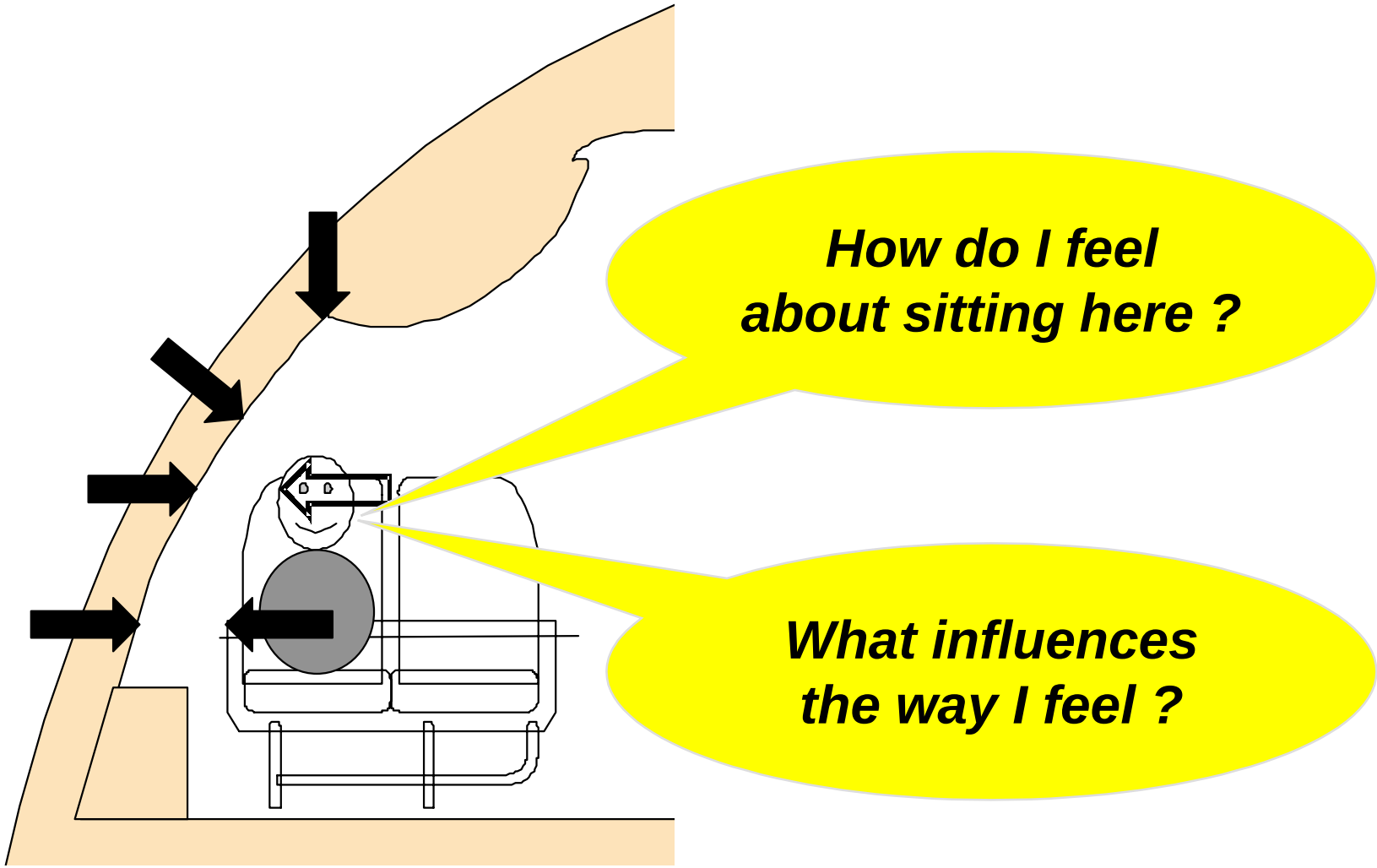
- **The passenger opinion is important also for the manufacturer**
  - A380 Airbus Industie First passenger survey 1998
    Second passenger survey 1999

Airline involvement

- ***20 major airlines*** have been shaping the design of the A3XX / A380 for five years
- They represent ***two thirds*** of seats offered in aircraft with more than 400 seats
- They all operate 747-400s on a ***wide range of mission types*** : very short to very long haul, high comfort to high density layouts, in all passenger, combi or freighter configurations
- They are the core of the ***global airline alliances*** taking shape
- ***Half of them*** are based in the Asia-Pacific area
- Their ***expertise*** in their business is widely recognized

Major 747-400 operators involved in A380 design since 1996

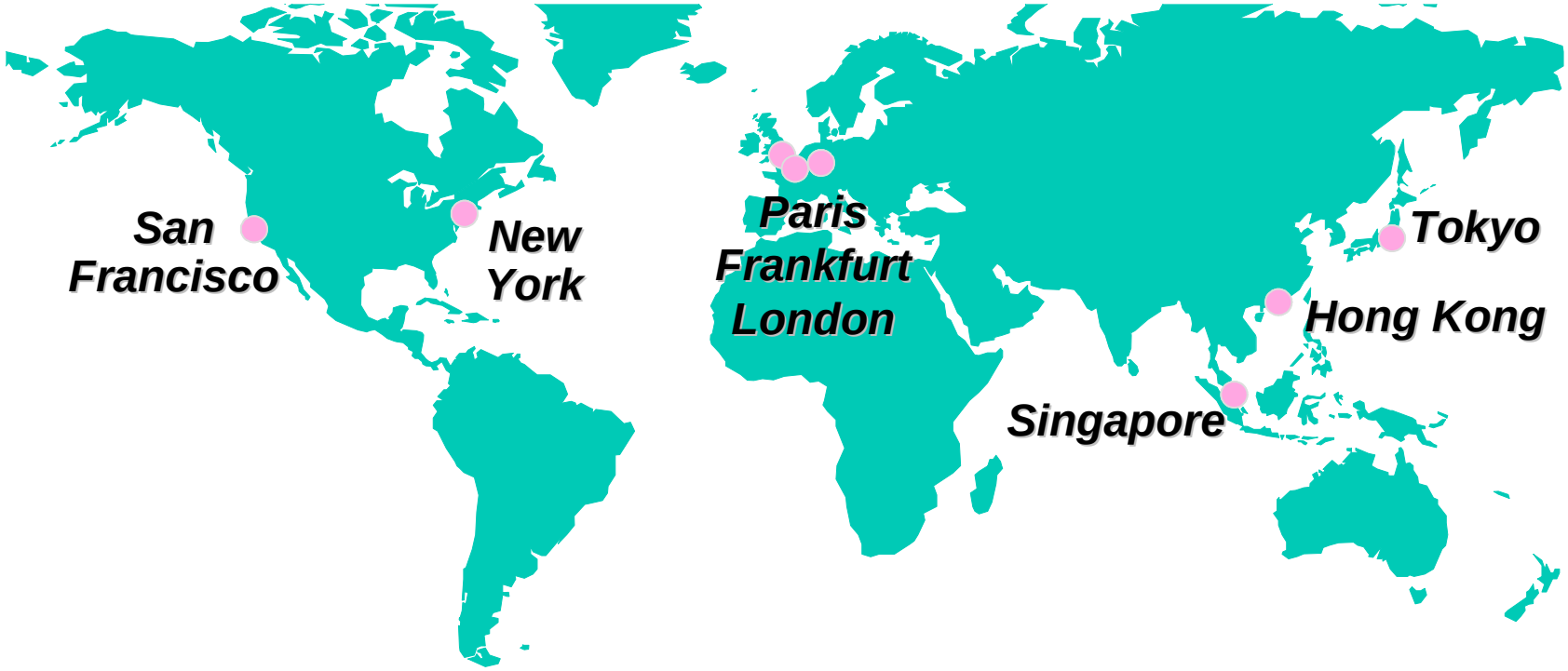
1998 passenger research



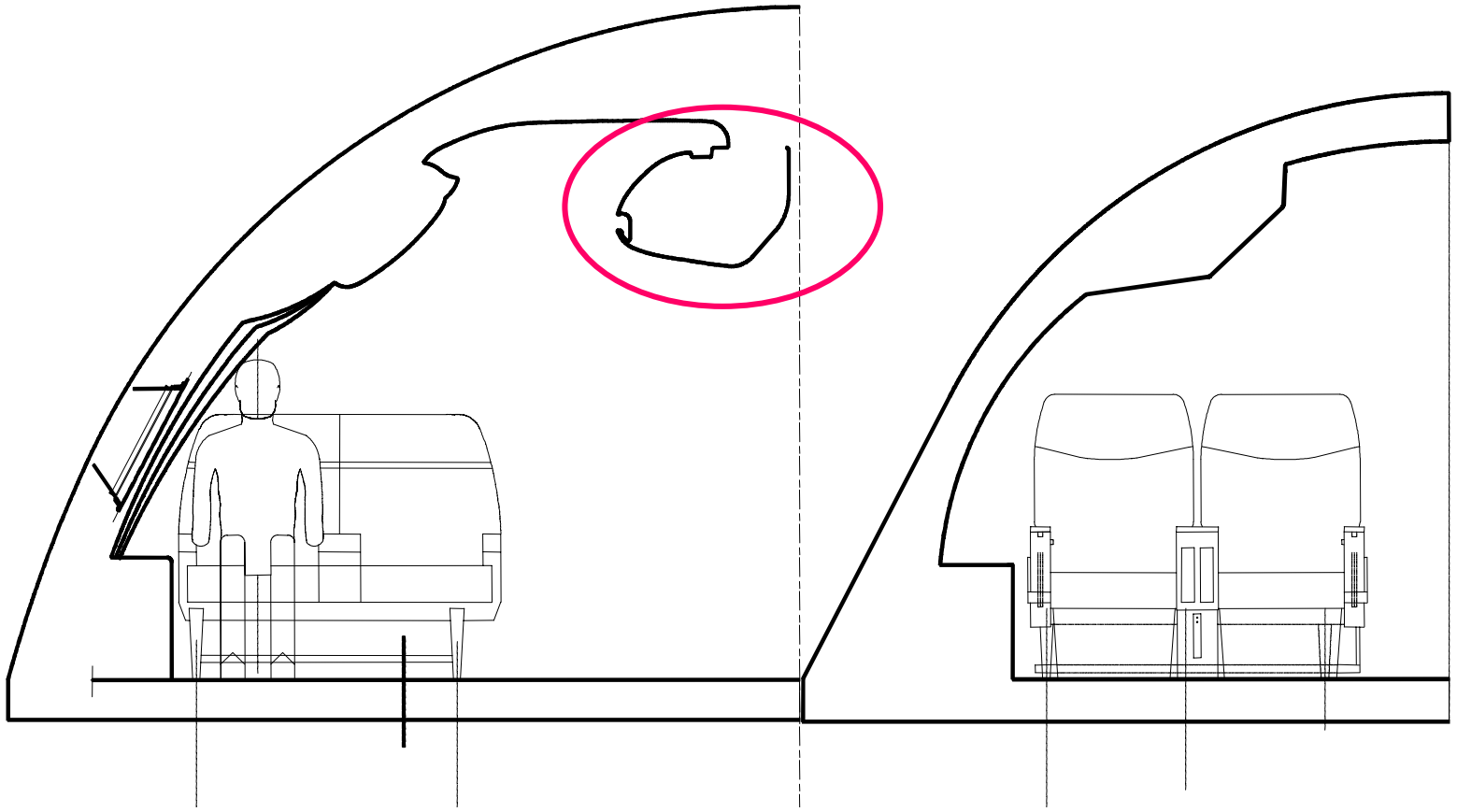
Scope of the project

- Fieldwork undertaken April - July 1998
- 8 cities in 3 continents
- Some 1 200 people surveyed
- Frequent long-haul travelers
- First, Business and Economy
- 2 000 man-hours of interviews
- 200 hours of recorded material
- Key A380 airlines invited to observe subject to signed NDA

Fieldwork

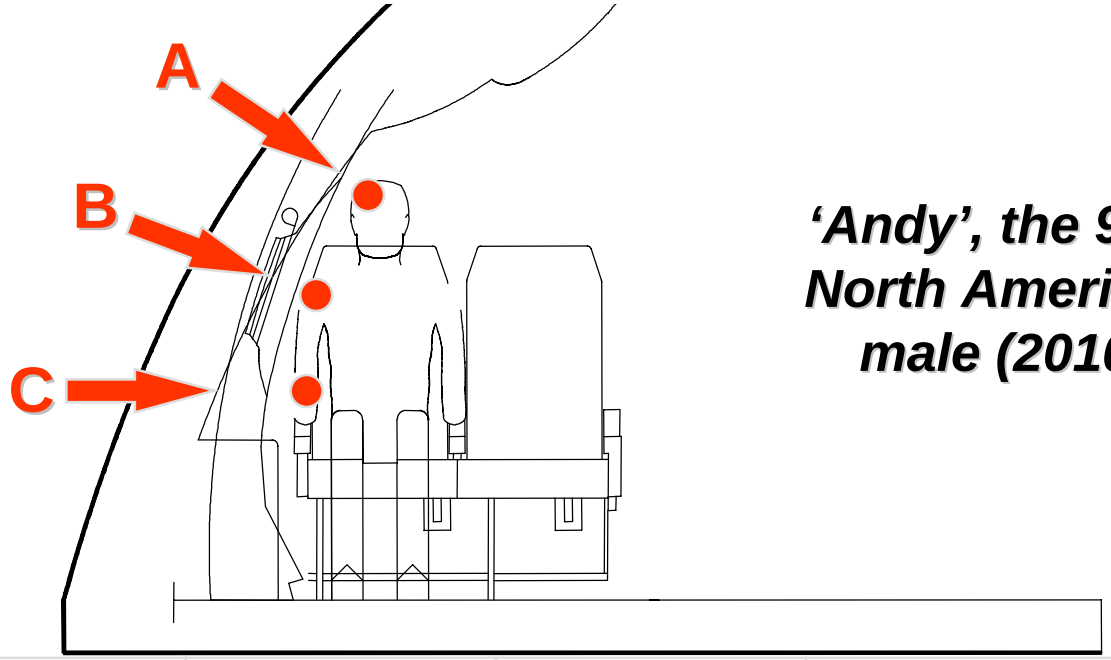

San Francisco
New York
Paris
Frankfurt
London
Tokyo
Hong Kong
Singapore

Upper deck mock-ups



A3XX variable geometry **747-400**

Economy Class clearances

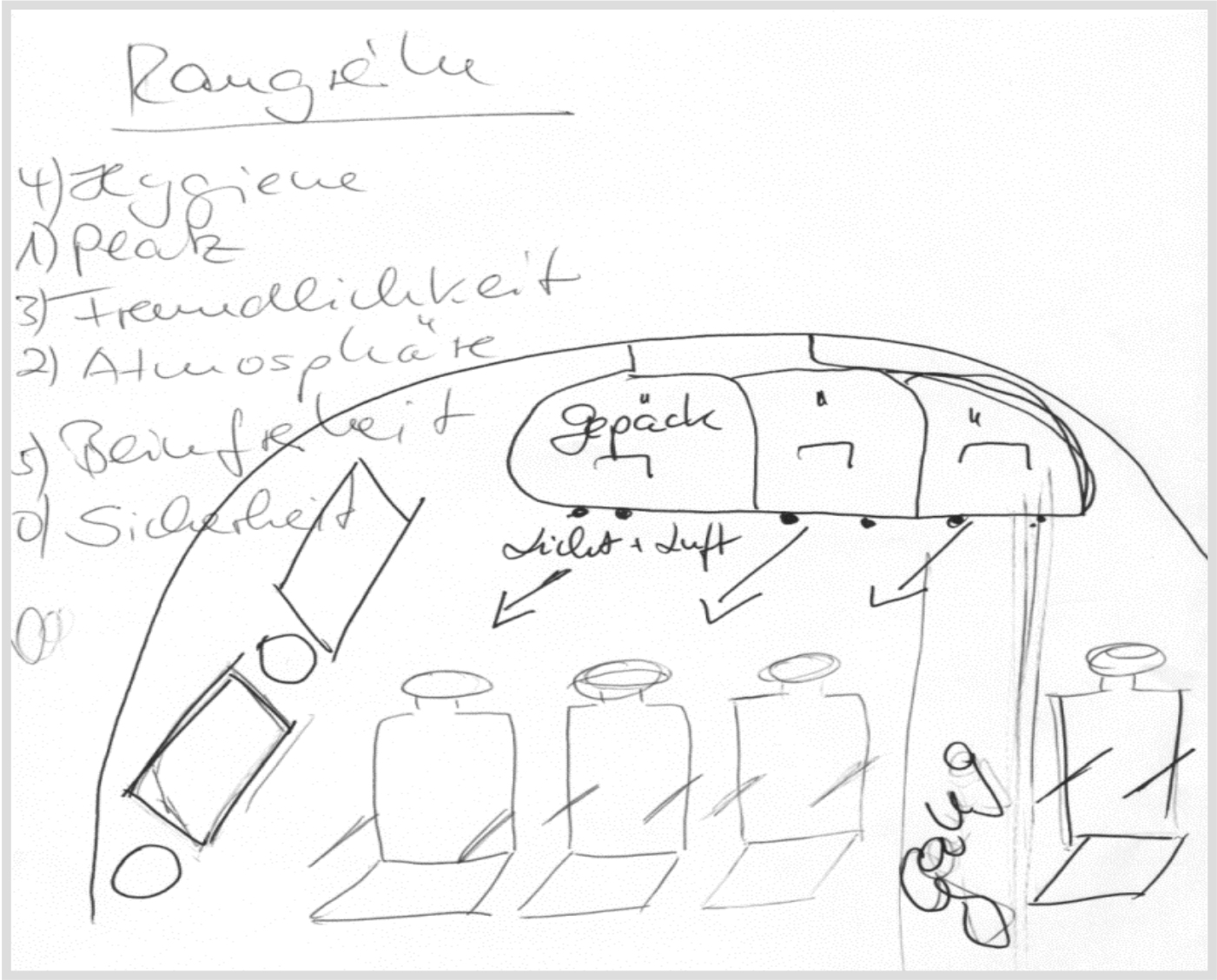


'Andy', the 95% North American male (2010)

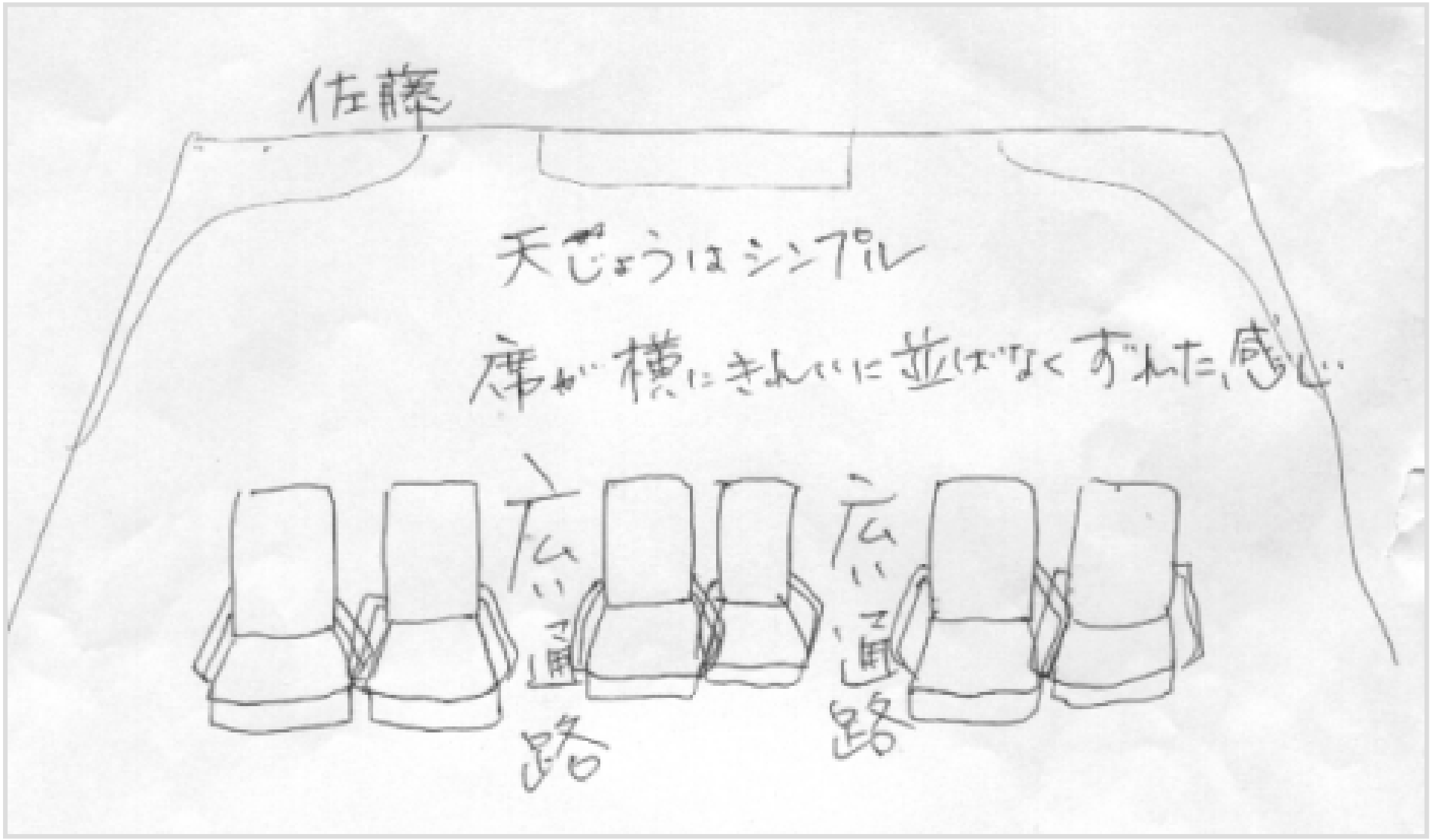
	Tight	Middle	*TLAR*		Loose
A	15	60	*70*	Change !	110
B	96	127	*40*		165
C	n/a	n/a	*20*		n/a

all dimensions in millimetres

FEMALE ECONOMY - GERMANY



FEMALE ECONOMY - JAPAN



Continuing cabin development

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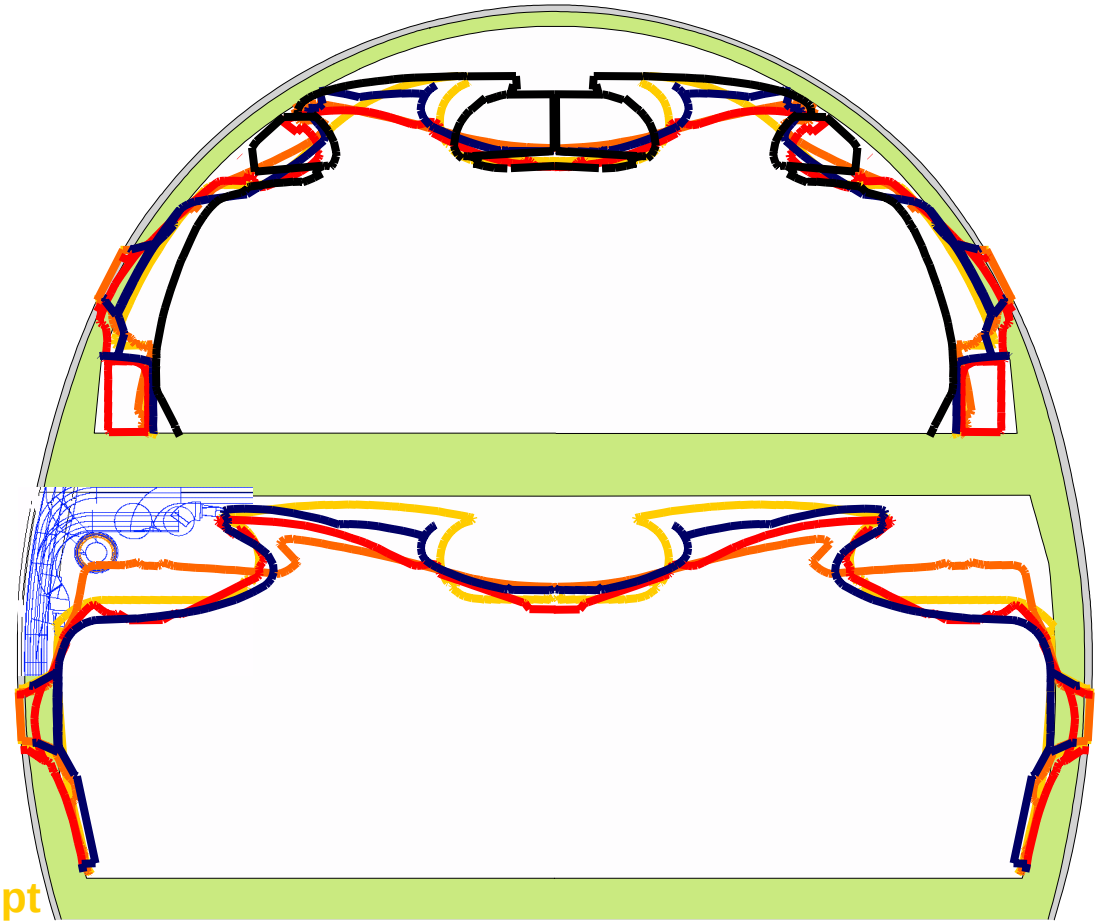
Comparison



The Yellow Concept
The Orange Concept
The Red Concept
The Blue Concept

Areas of concern

- Luggage stowage
- Illumination
- Air Condition
- Seat spacing / comfort
- Entertainment Systems

The boarding experience - more space when most needed

Overhead stowages sized to stow “roll-aboard” luggage (L=24in)

Lighting

Study Items

1. Glass fibre optic RL

Specification under work, release for Vendor Selection planned for 02/00.

Verification of eye safety in combination with extreme small light output diameters is outstanding . NO PUBLISHED CONCLUSION AT 01/01

2. T5 fluorescent tubes

As no short length tube is available on the market, this item is postponed to A3XX (frame pitch 25” instead of 21”, which makes 600mm tubes possible)

3. Lighting temperature adaption

No space for additional coloured fluorescent tubes available,but as alternative concept coloured piggy-bag LED-strips are under investigation.

Performance still TBD. Long-running “debate” with VIR and AIM

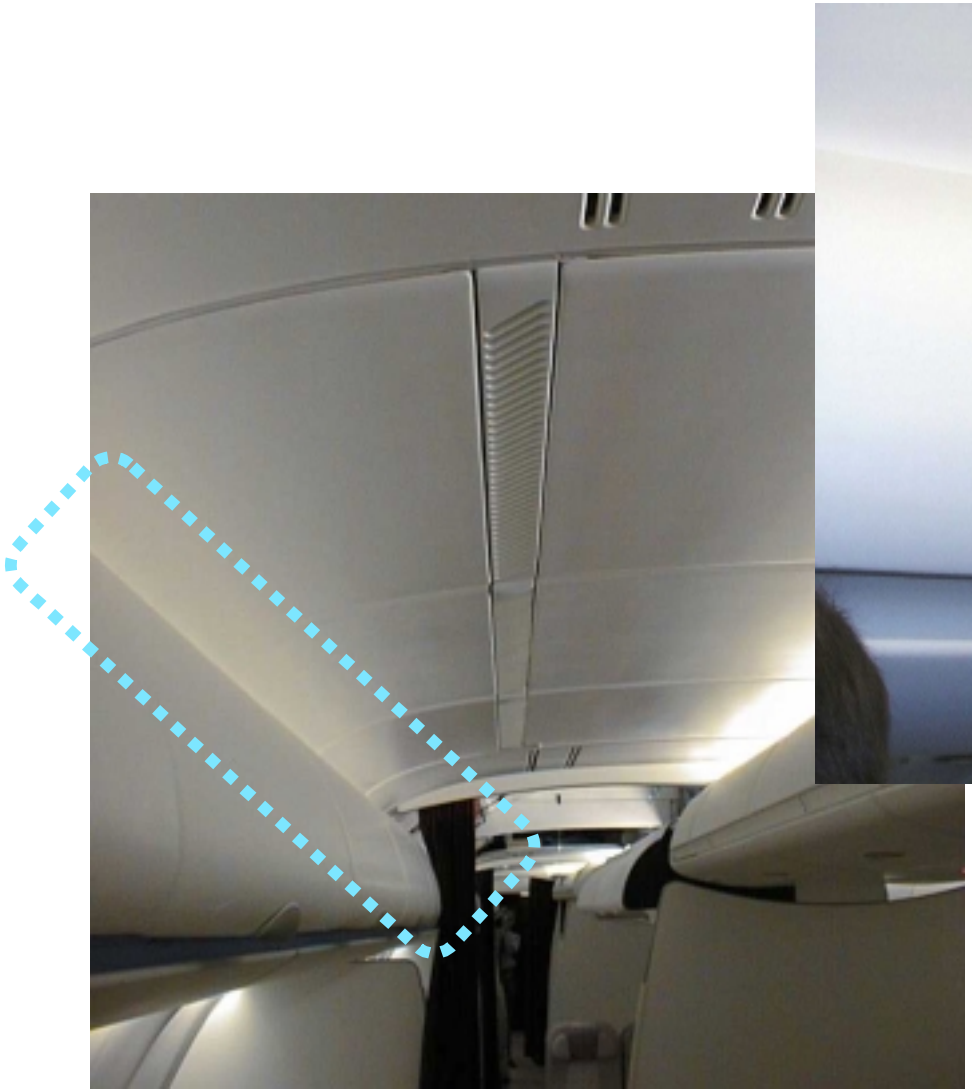
This feature would be an alternative to LLL only

sidewall lighting

26mm tri-phosphor

current A340
26mm

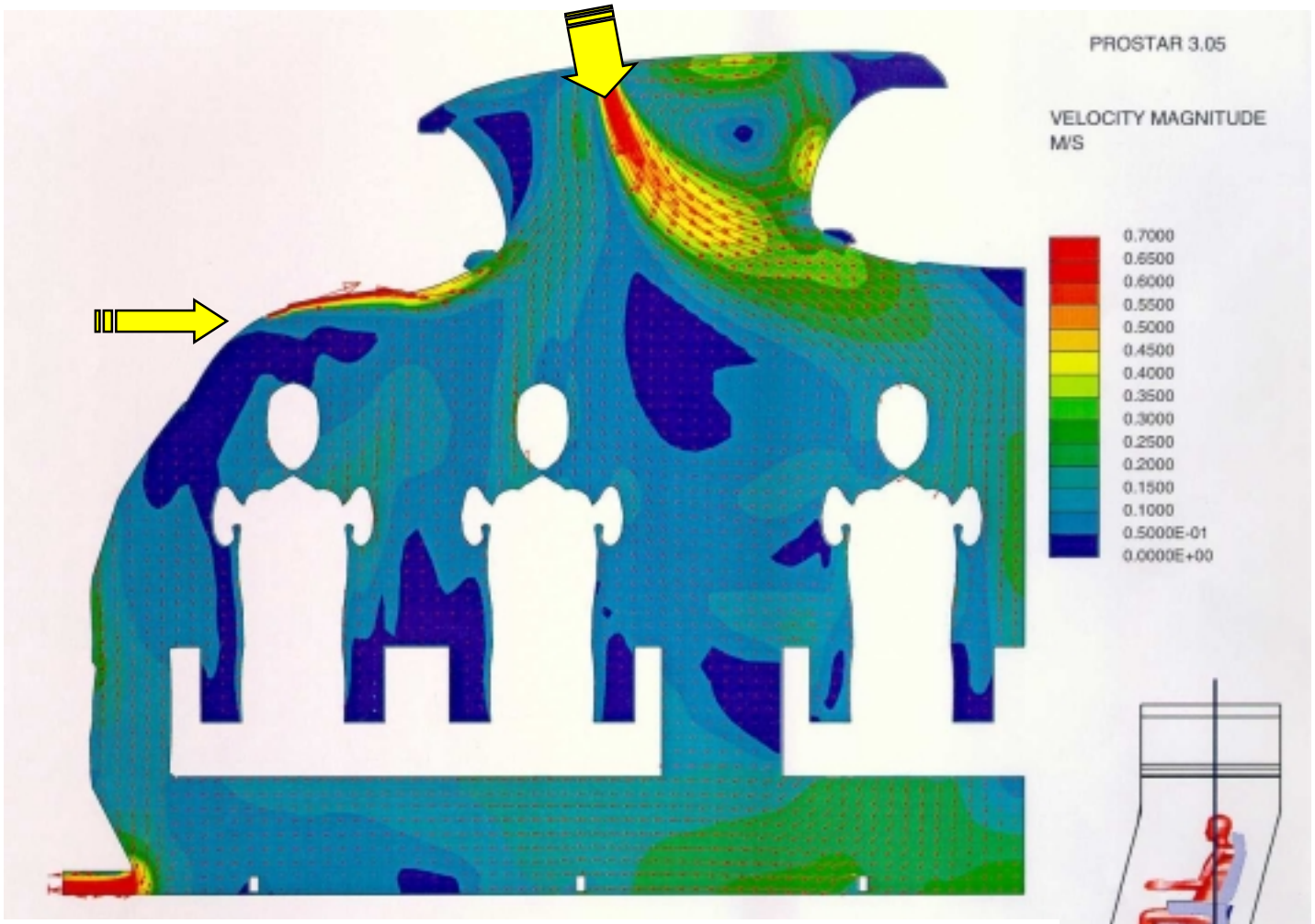
Something for nothing



Something for nothing

Is the lighting effective?

Aircondition



Extensive analysis using powerful Computerized Flow Dynamics (CFD) techniques showed that with only two ceiling outlets, a comparable comfort level with the A340-300 was not achievable

The aircraft cabin ...

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... is strongly influenced by its contents

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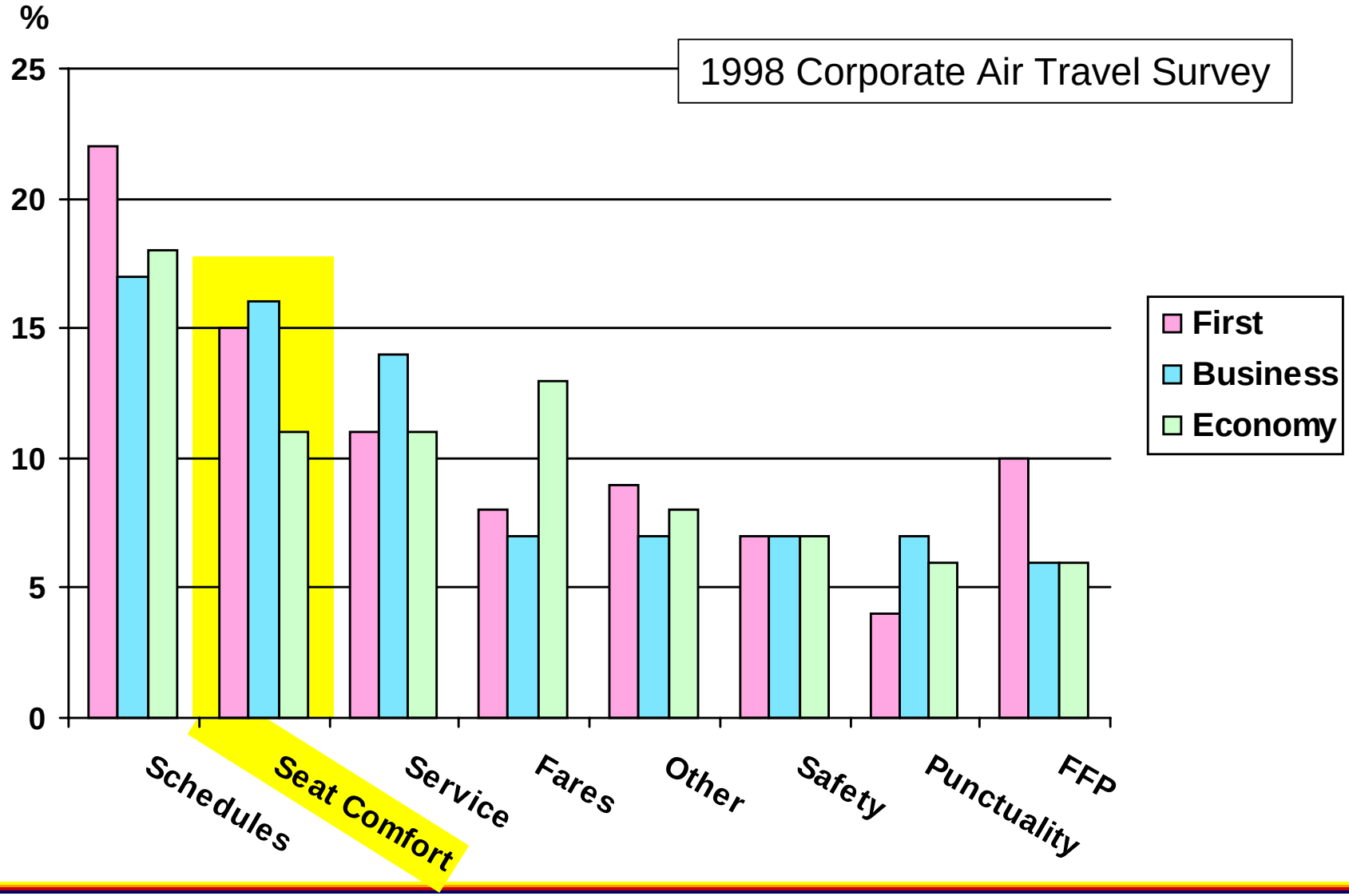
Drivers for choice of airline

Long-haul by class



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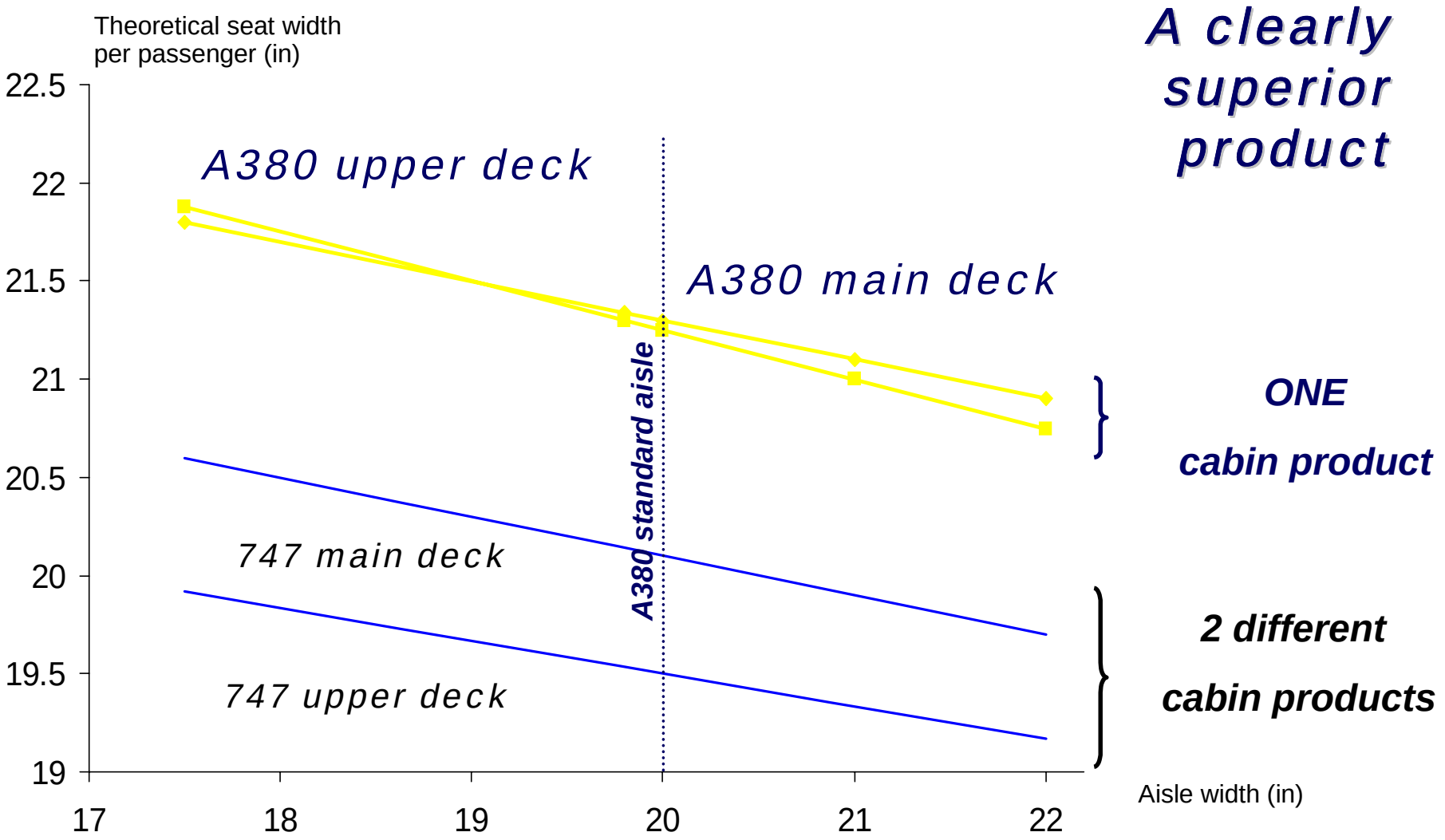
Economy Class



Passenger's perspective in-flight

CIDS/FAP

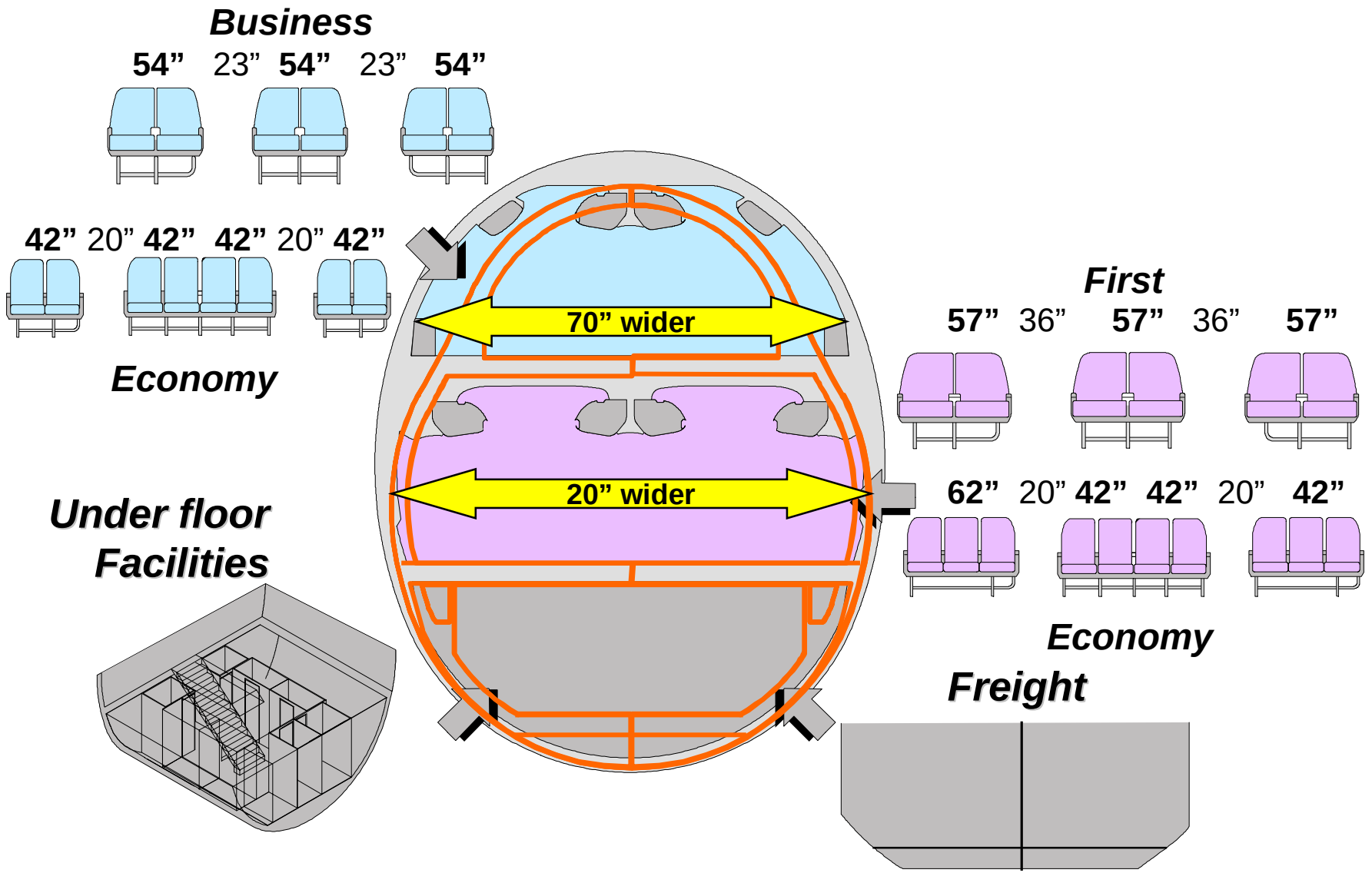
Growing demand for greater number of zones

Customisation

A380

Cabin Concept

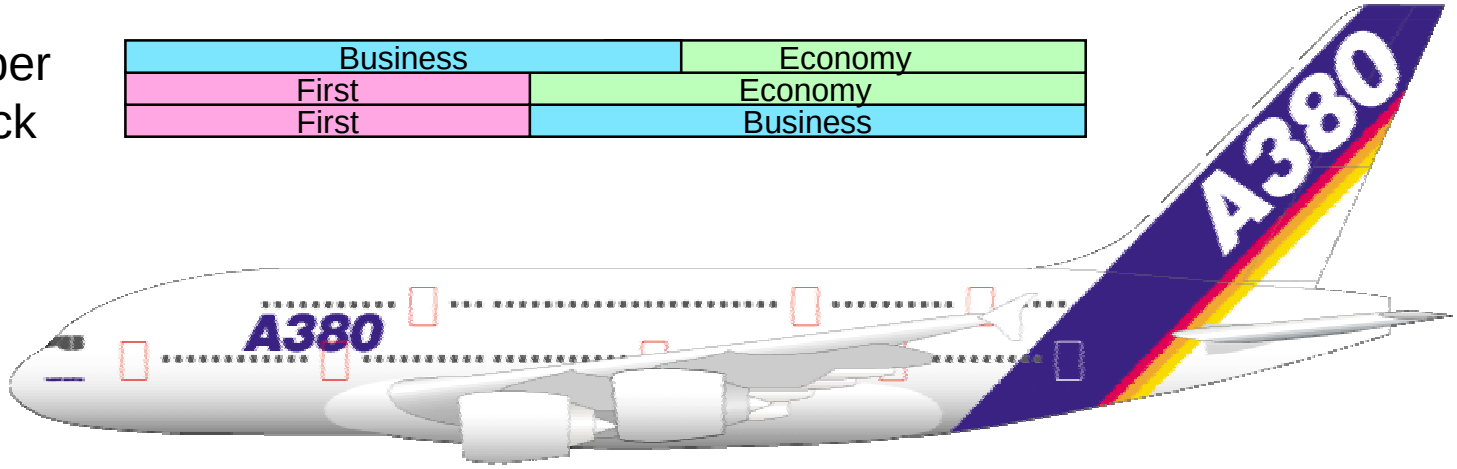
A380 Cabin cross section



A380 zone flexibility

Upper deck

Business	Economy
First	Economy
First	Business



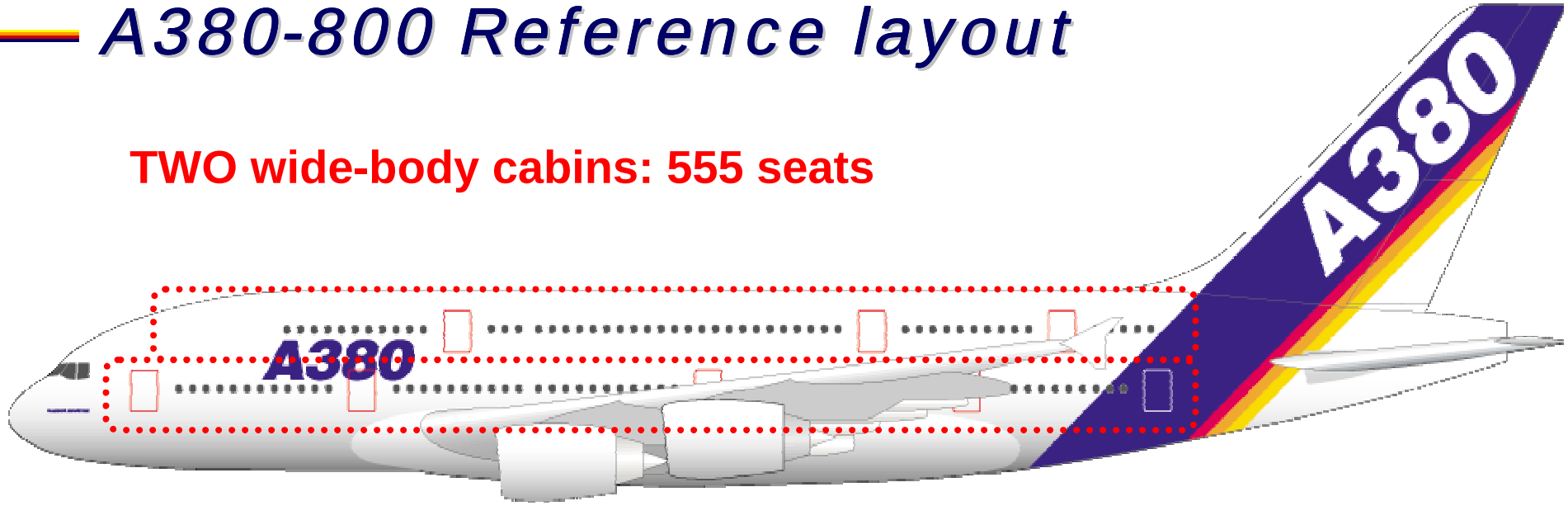
Main deck

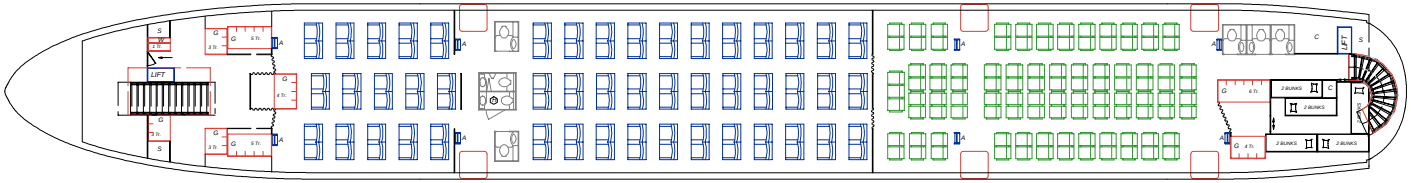
First	Economy
Business	Economy
Economy	

... the potential to develop solutions for all future market mixes

A380-800 Reference layout

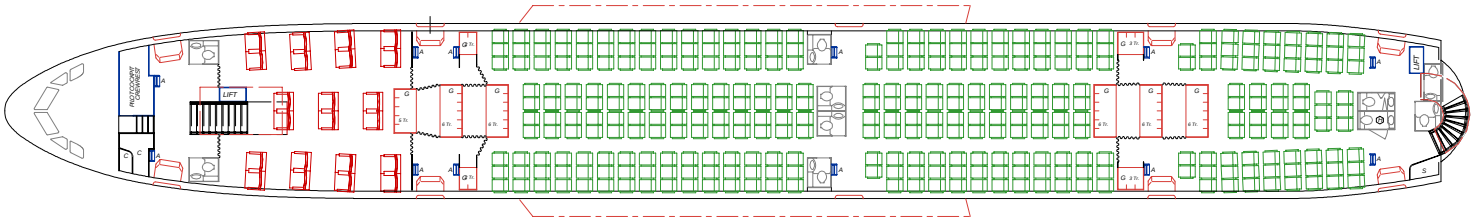
TWO wide-body cabins: 555 seats





Upper deck

96 Business **103 Economy**



Main deck

22 First **334 Economy**

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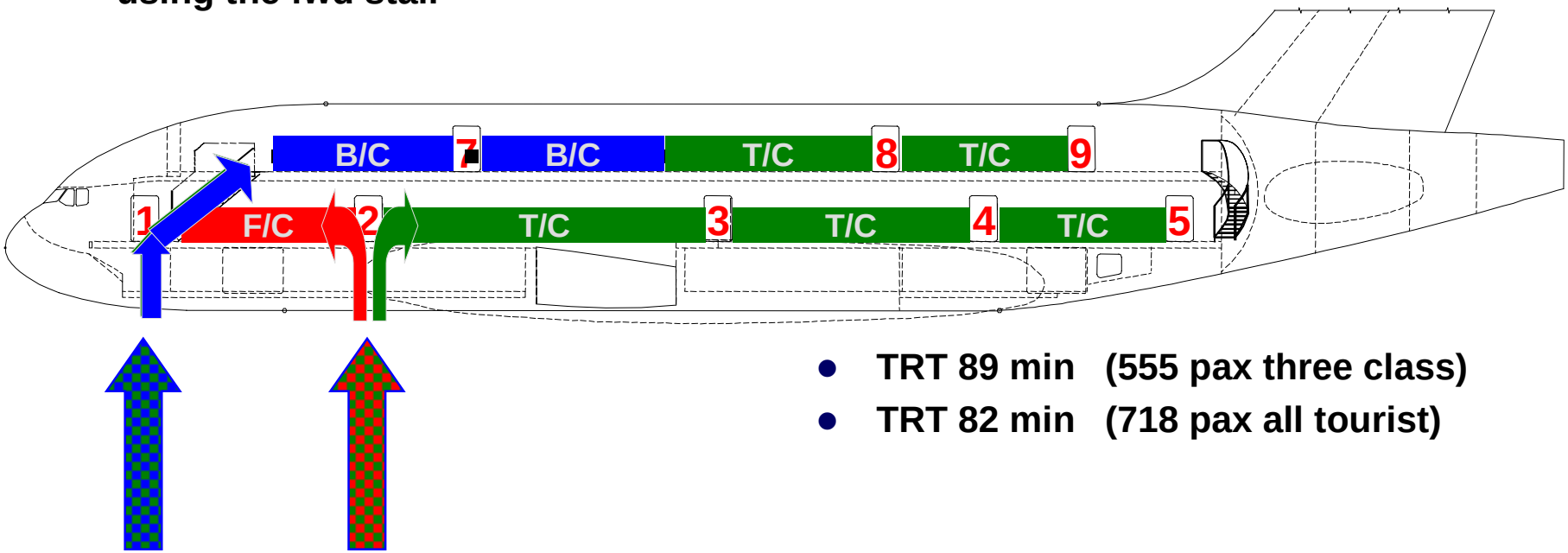
A380 Passenger boarding concept

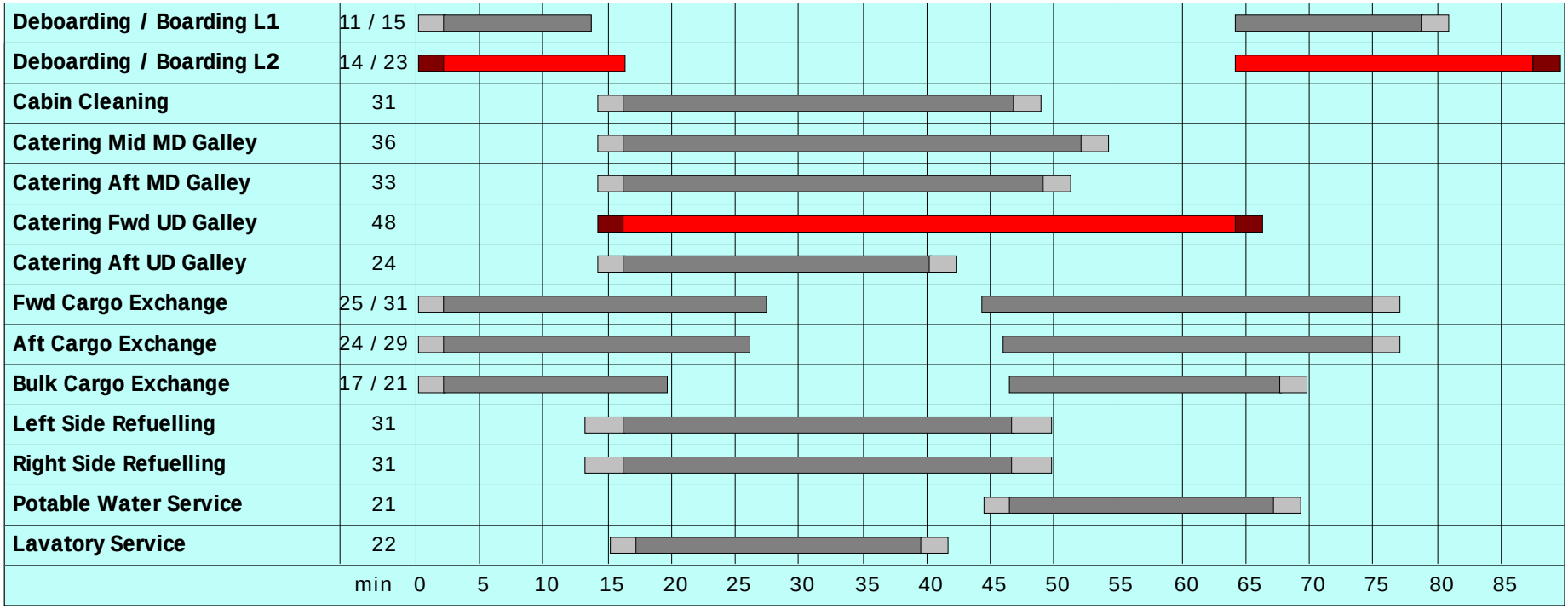
Upper deck boarding via door 1 using the fwd stair



- **TRT 89 min (555 pax three class)**
- **TRT 82 min (718 pax all tourist)**

Main deck boarding via door 2

Ref. A3XX-100 Turn-round time (555 pax)



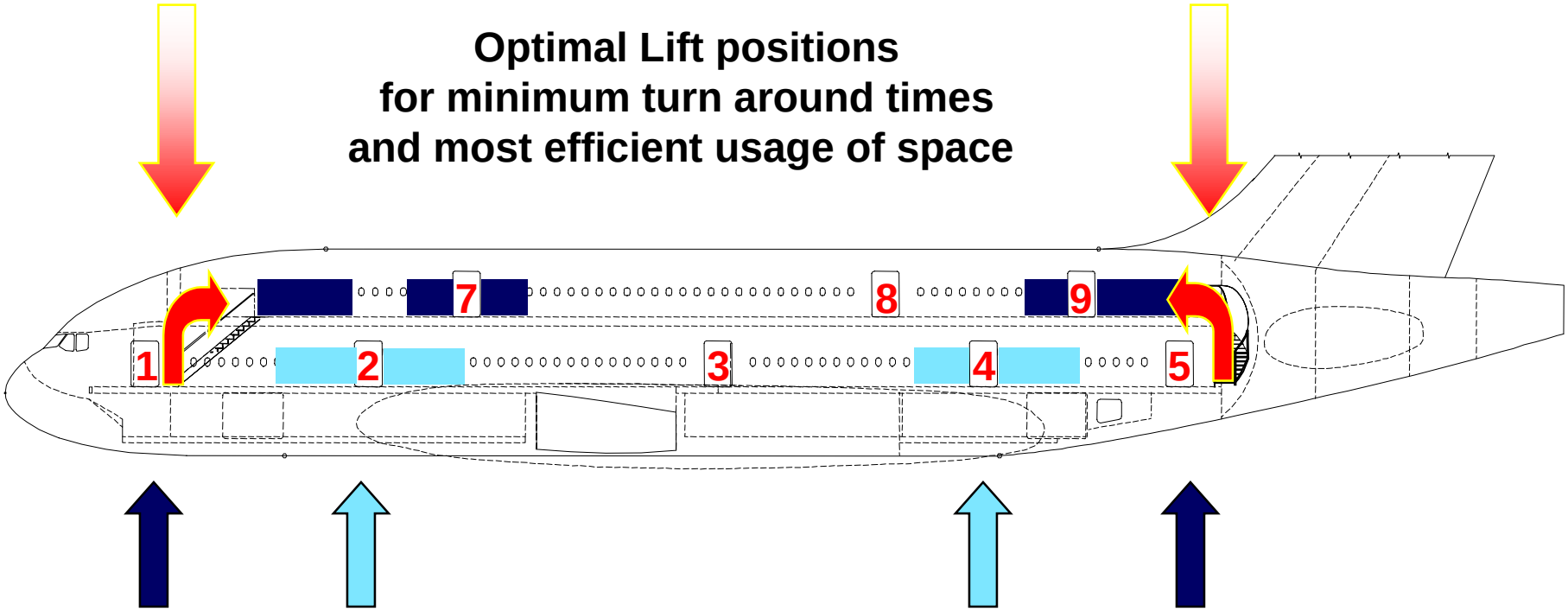
Total Servicing Time = 89 min

Passenger Boarding
Door L1: 205 Pass board at a rate of 14.0 pass/min
Door L2: 350 Pass board at a rate of 15.0 pass/min
Passenger Deboarding
Door L1: 205 Pass deboard at a rate of 18.0 pass/min
Door L2: 350 Pass deboard at a rate of 25.0 pass/min
Cabin Cleaning
Door L5: Cleaning with 12 cleaning agents
Catering Service
Mid Main Deck Galley at Door R2: 24 FSTE (at 1.5 min)
Aft Main Deck Galley at Door L4: 22 FSTE (at 1.5 min)
Fwd Upper Deck Galley at Door R1: 24 FSTE (at 2.0 min)
Aft Upper Deck Galley at Door R5: 12 FSTE (at 2.0 min)
Aircraft Refuelling
Left Side Pressure Refuel Connector: 122000l at 4000 l/min
Right Side Pressure Refuel Connector: 122000l at 4000 l/min

Cargo Unloading
Fwd Cargo Door: 18 HSC (at 1.4 min)
Aft Cargo Door: 17 HSC (at 1.4 min)
Cargo Loading
Fwd Cargo Door: 18 HSC (at 1.7 min)
Aft Cargo Door: 17 HSC (at 1.7 min)
Baggage/Bulk Cargo Unloading
Bulk Cargo Door: 2000 kg at 115.0 kg/min
Baggage/Bulk Cargo Loading
Bulk Cargo Door: 2000 kg at 95.0 kg/min
Lavatory Service
Waste Water Service Panel: 3000 l waste water at 143.0 l/min 54 l flush water at 38.0 l/min
Potable Water Service
Potable Water Service Panel: 1800 l at 87.5 l/min

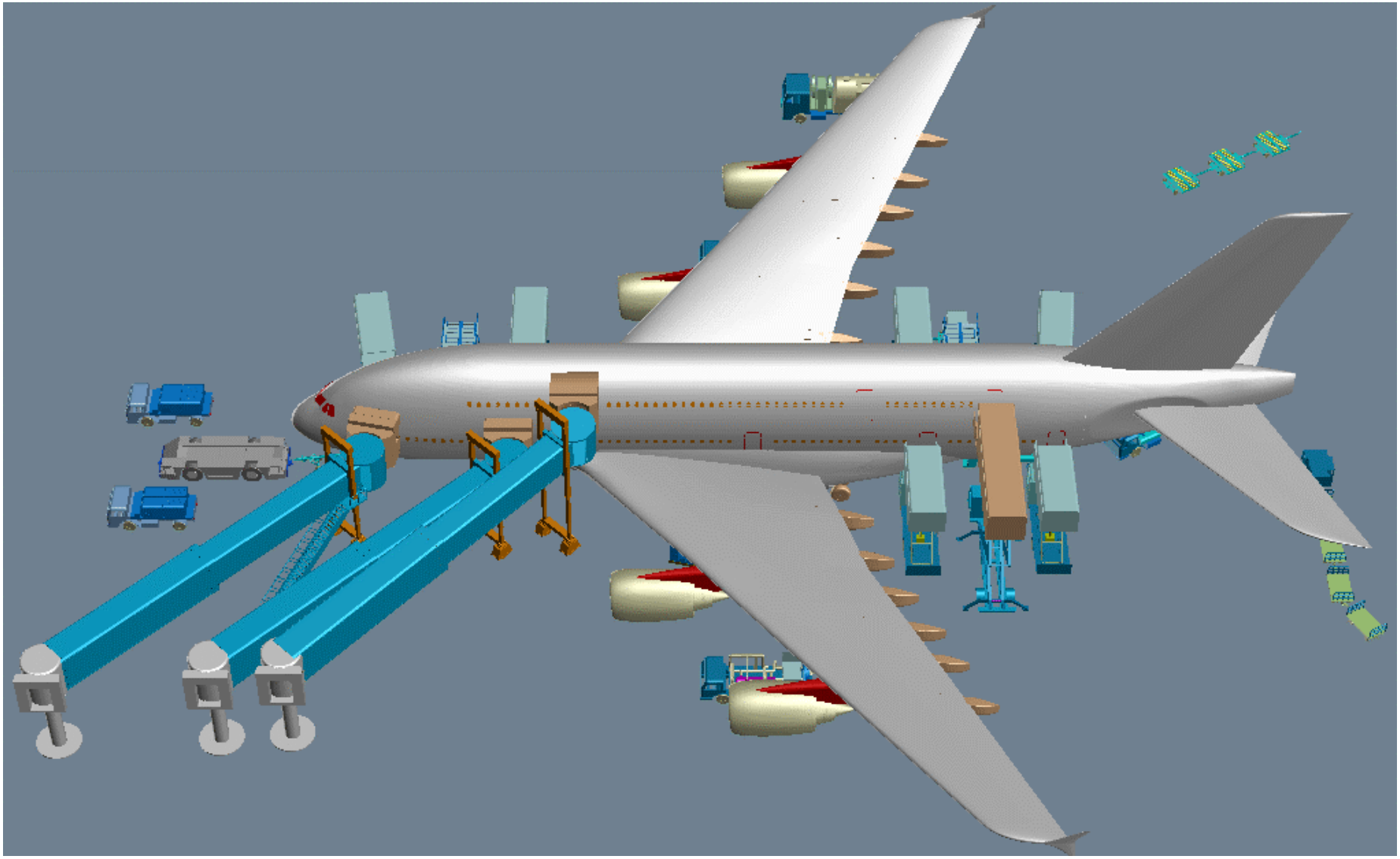
A380 Lift position / Service concept

Optimal Lift positions
for minimum turn around times
and most efficient usage of space



Simultaneous servicing possible

A380 Ramp set up



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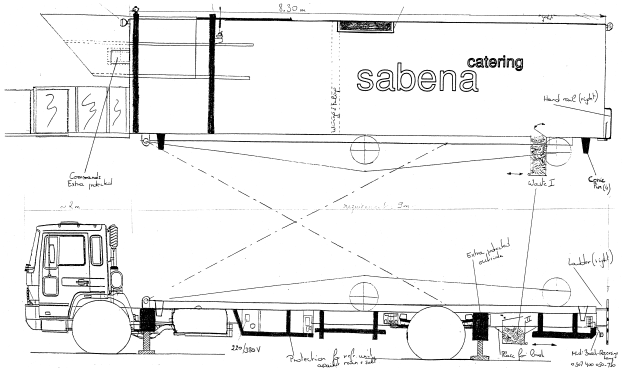
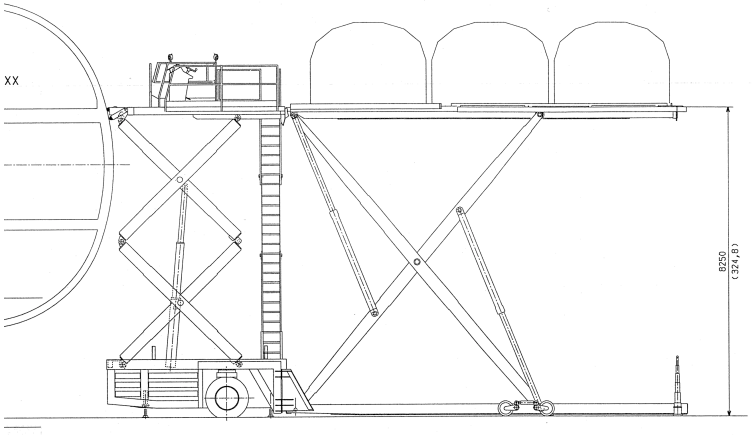
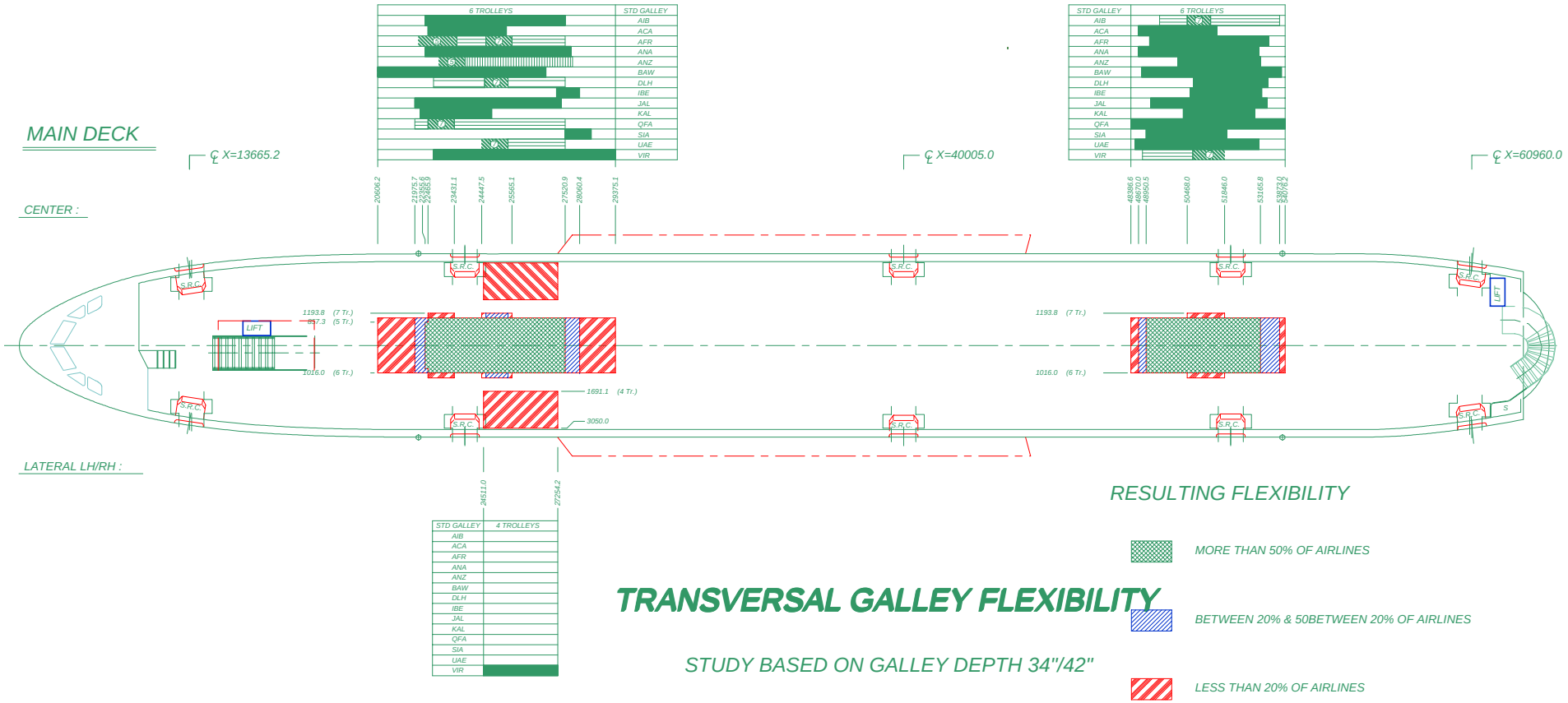
Upper Deck servicing





Solutions will exist to serve the A380 Upper Deck

Flexibility - Trans. Galleys on MD



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Flexibility - Lavatories on MD