



Hochschule für Angewandte Wissenschaften Hamburg
Hamburg University of Applied Sciences
Department of Automotive and Aeronautical Engineering

EWADE 2005

7th European Workshop on Aircraft Design Education
SupAéro, Toulouse

Aircraft Cabin and Cabin Systems – From Short Course to Degree Programme



Dieter Scholz



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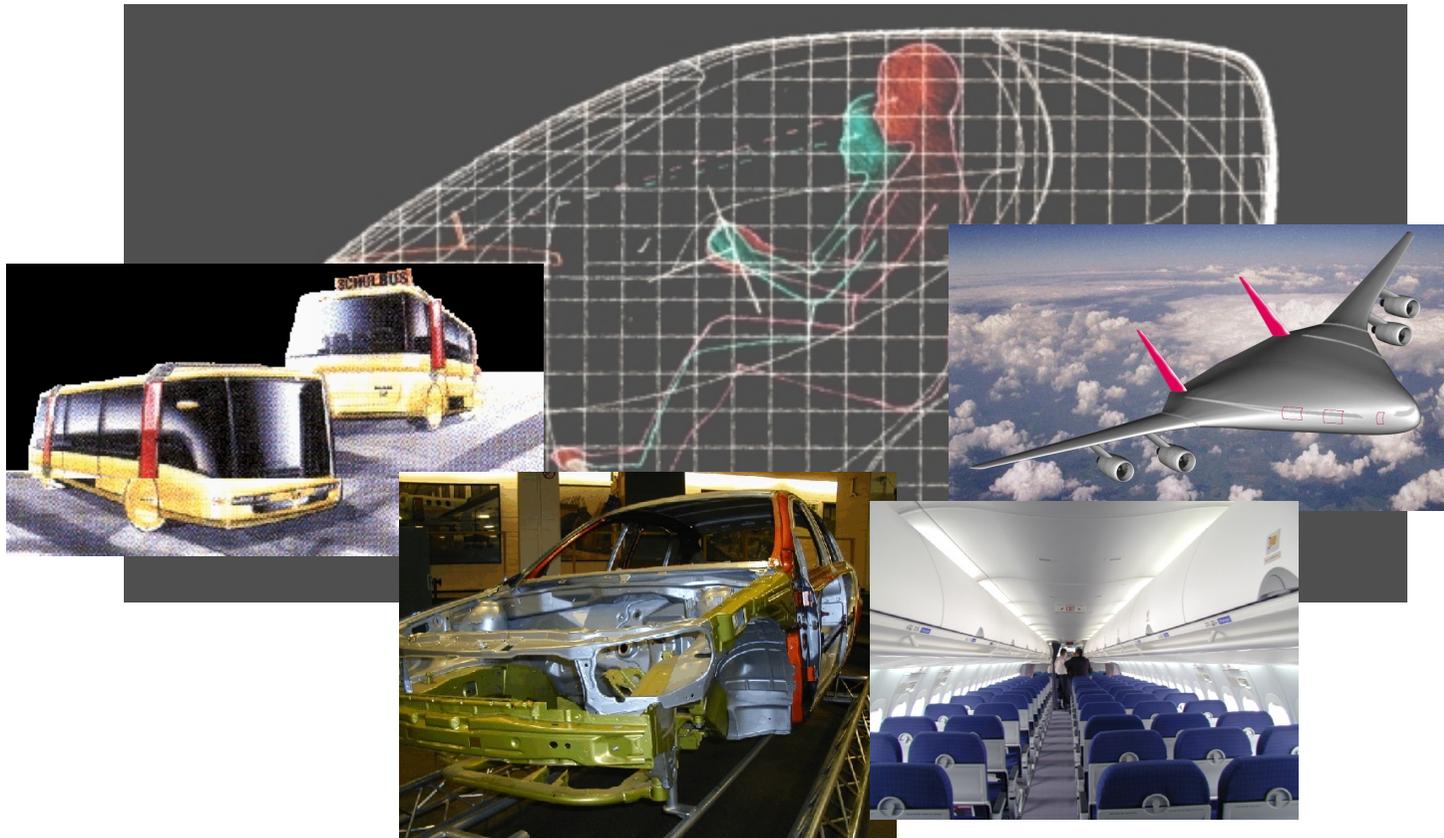
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Aircraft Cabin and Cabin Systems – From Short Course to Degree Programme



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Introduction to HAW Hamburg





HAW Hamburg

- university of applied sciences = second university system in Germany
- characteristics: modern and practical teaching
- the students are often the first choice of industry
- 13000 students
- 13 departments
- 40 degree courses
- location: city centre of Hamburg

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main building

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Department of Automotive & Aeronautical Engineering

- 1200 students
 - 800 students: automotive engineering
 - 400 students: aeronautical engineering
- ~ 42 professors
- ~ 20 lecturers from industry
- ~ 22 staff in labs, ...
- 5 laboratories:
aero, structure, CAD, automotive, flight testing

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Courses in Automotive & Aeronautical Engineering

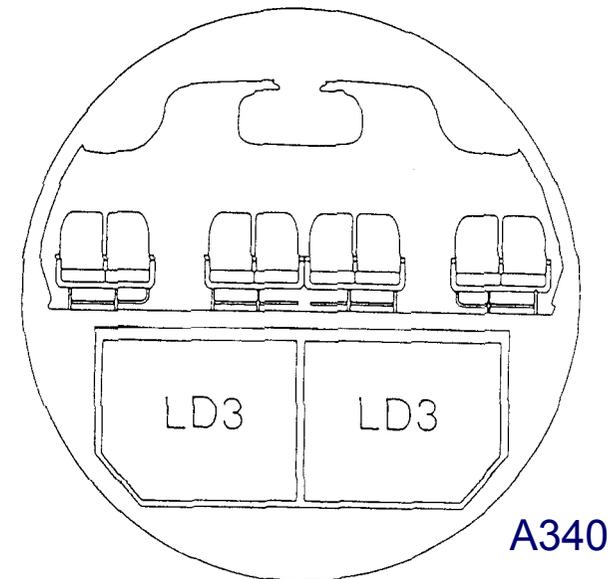
- Dipl.-Ing. (BEng): Fahrzeugtechnik 
- Dipl.-Ing. (BEng): Flugzeugbau 
- MEng: Lightweight Vehicle Structures 
- MEng: Lightweight Aeronautical Structures 

Aircraft Cabin (Aircraft Design View)

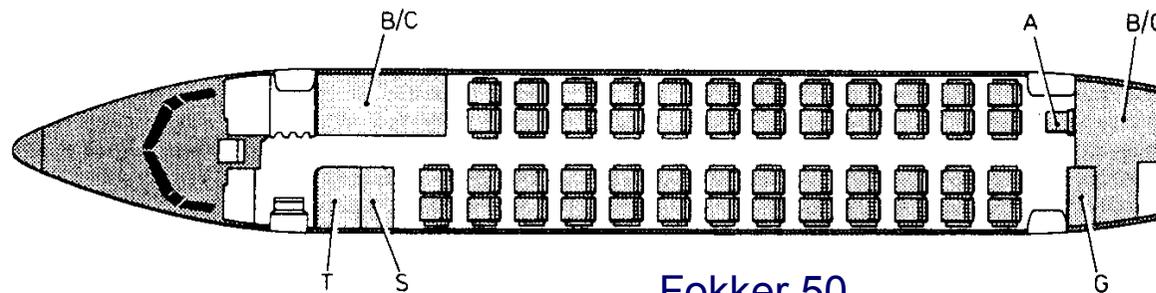
- number of seats abreast

$$n_{SA} = 0.45 \cdot \sqrt{n_{PAX}}$$

- cross section
- cabin layout
- emergency exits (size, number, location)



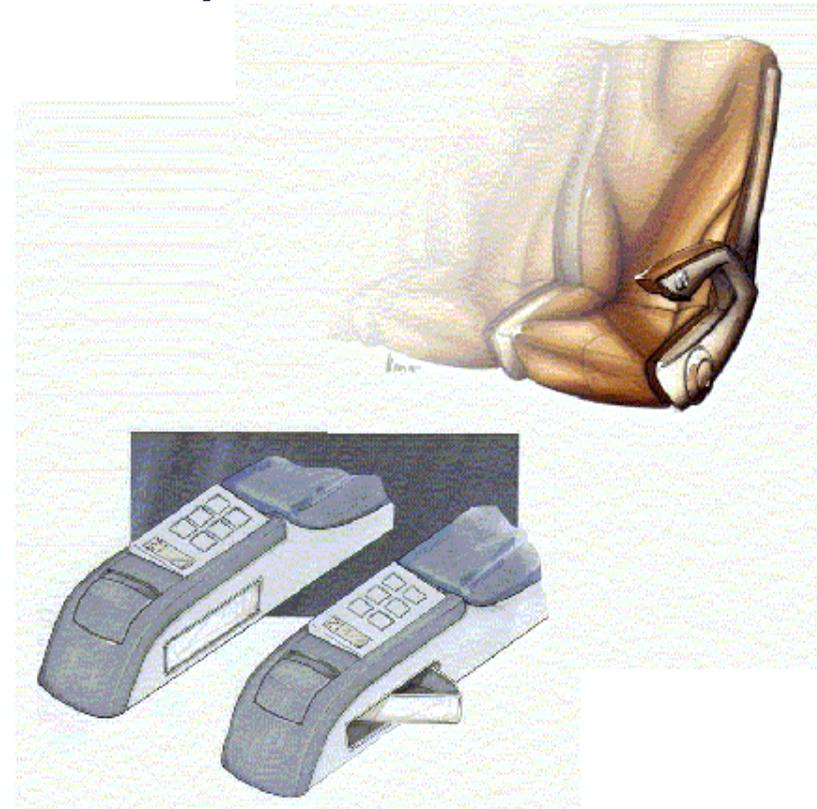
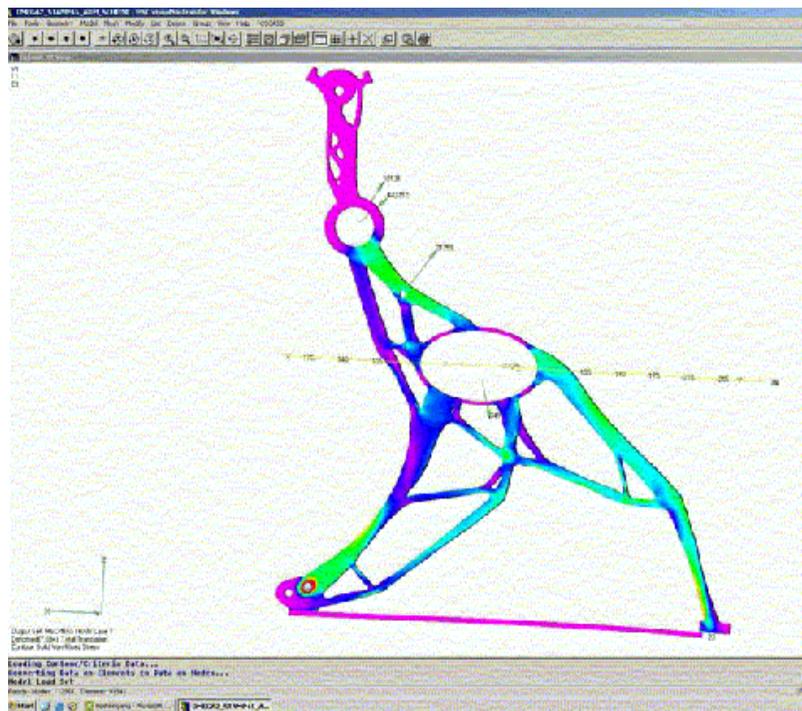
A340



Fokker 50

Aircraft cabin (Extended View)

- **Seats:** Design and Construction

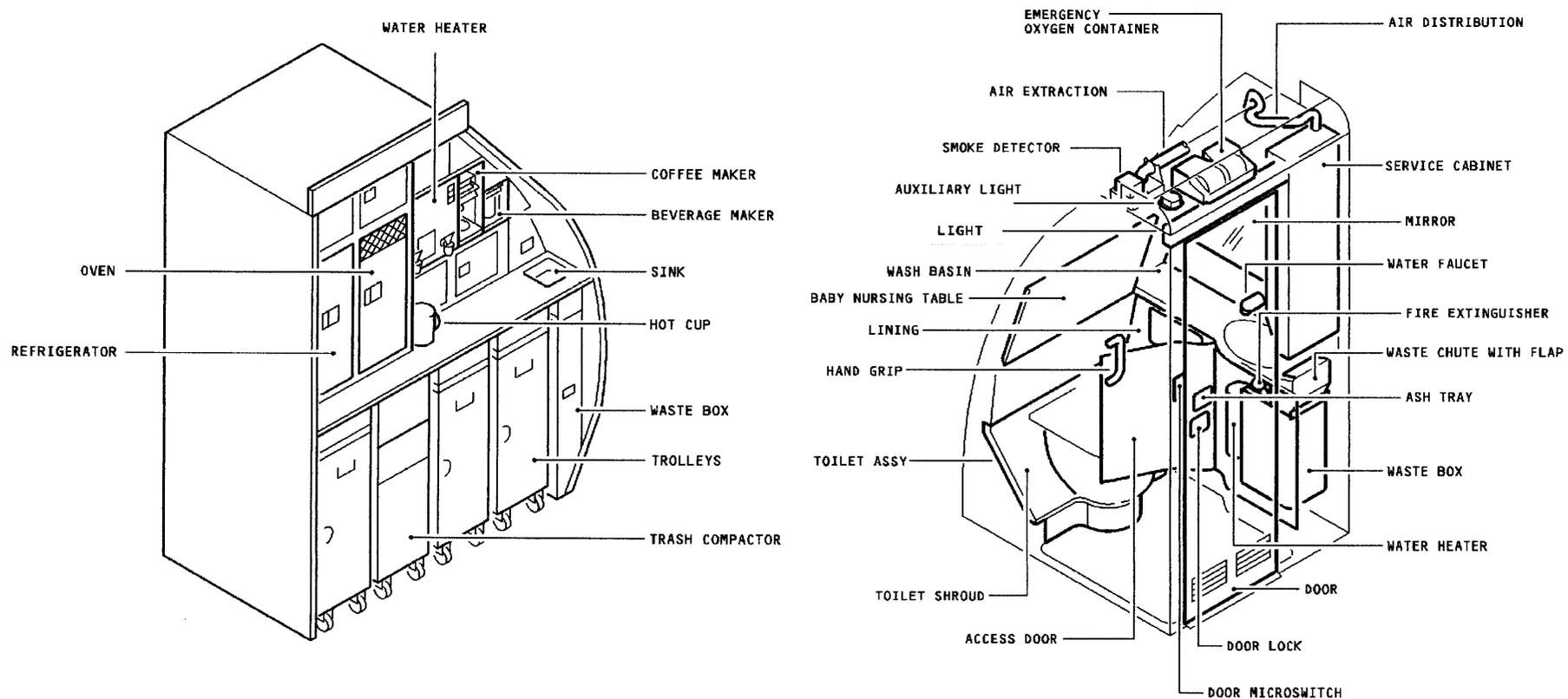


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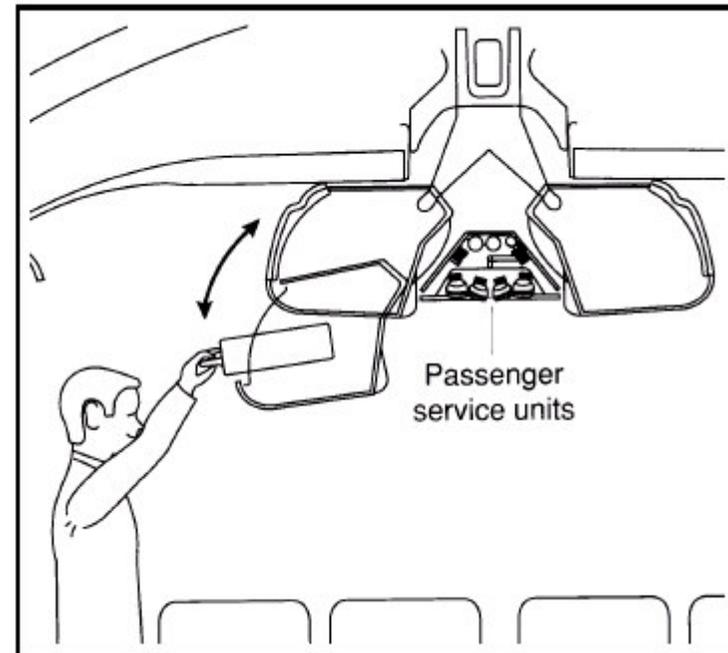
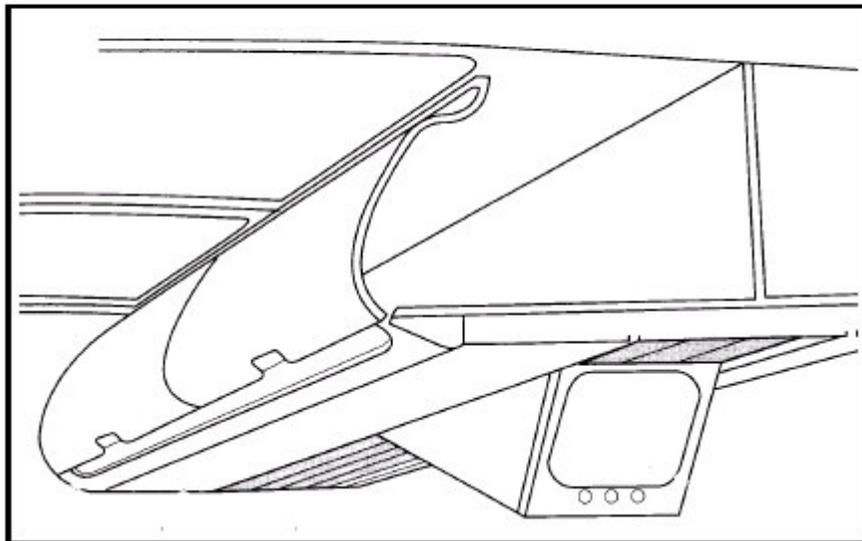
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- **Monuments:** galleys and lavatories



SCHOLZ, Dieter: Aircraft Systems. In: DAVIES, Mark: *The Standard Handbook for Aeronautical and Astronautical Engineers*.
New York : McGraw-Hill, 2003

- Hatracks

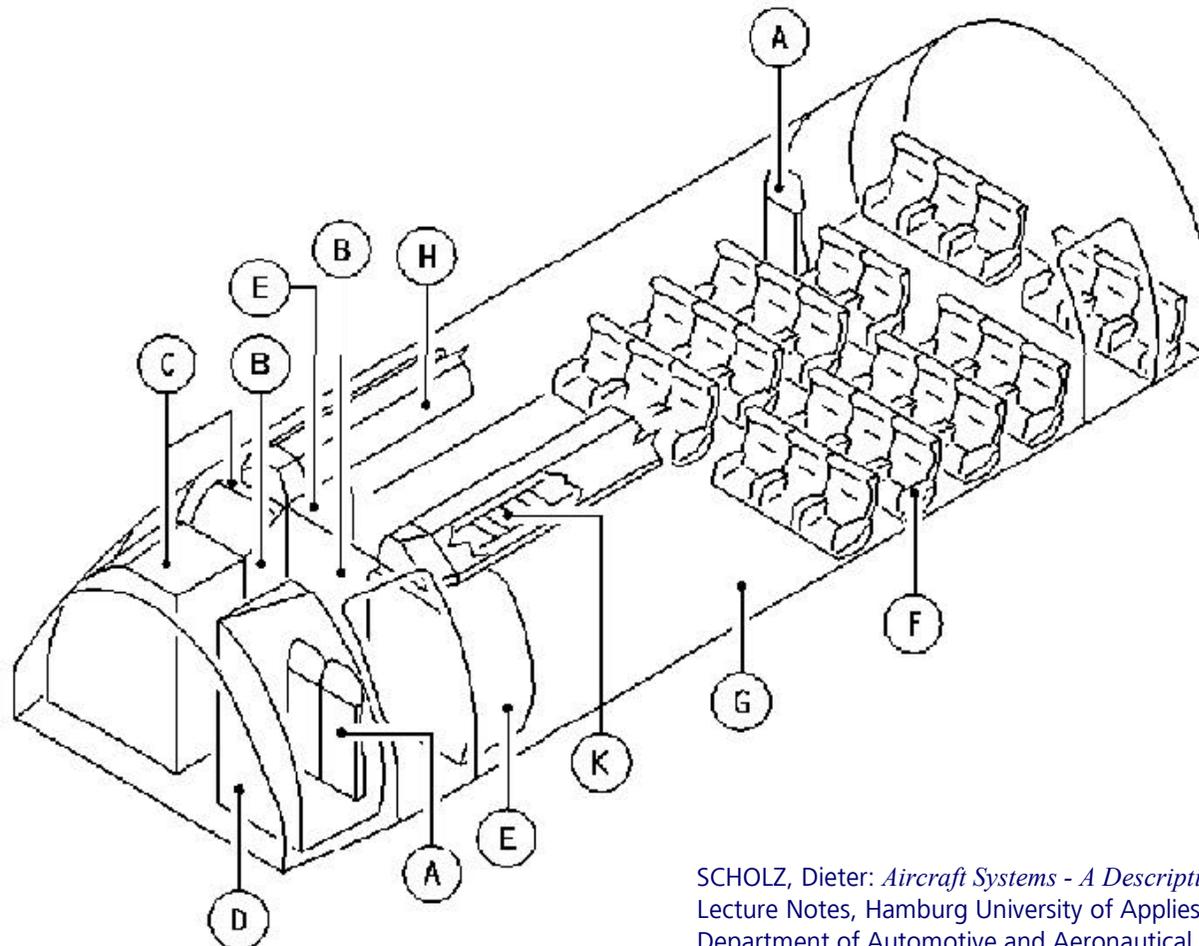


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- Cabin layout: placement of cabin items



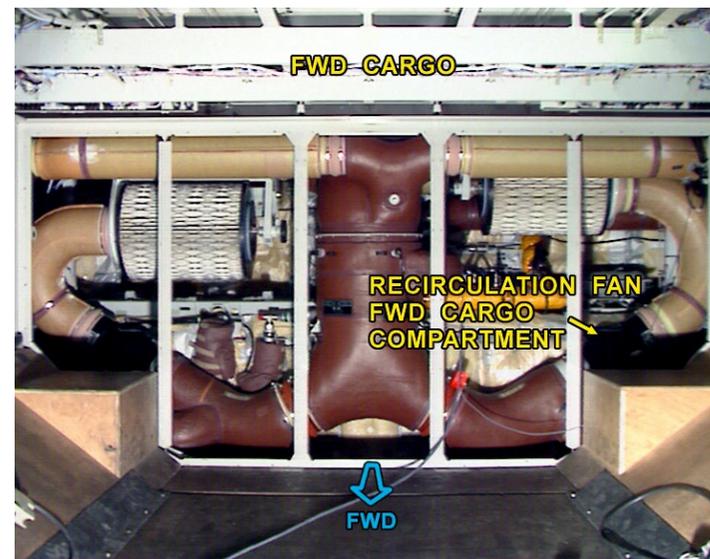
SCHOLZ, Dieter: *Aircraft Systems - A Description of the Airbus A321*.
Lecture Notes, Hamburg University of Applied Sciences,
Department of Automotive and Aeronautical Engineering, 2001

Aircraft Cabin Systems

1. **Definition** (taken from day to day engineering):
"Cabin systems are all aircraft systems that are related to the cabin"
2. Selected aircraft systems and subsystems from 1.) as defined in
ATA iSpec 2200 (ATA: Air Transport Association of America)

21 Air Conditioning

- 21-10 Compression
- 21-20 Distribution
- 21-30 Pressurization Control
- 21-40 Heating
- 21-50 Cooling
- 21-60 Temperature Control
- 21-70 Moisture/Air Contaminant Control



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25 Equipment/Furnishings

- 25-20 Passenger Compartment
- 25-30 Galley
- 25-40 Lavatories
- 25-50 Additional Compartments
- 25-60 Emergency
- 25-80 Insulation



26 Fire Protection

- 26-10 Detection
- 26-20 Extinguishing

30 Ice and Rain Protection

- 30-70 Water Lines



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ATA 25

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ATA 26 Fire Protection

33 Lights

- 33-20 Passenger Compartment
- 33-30 Cargo and Service Compartments
- 33-50 Emergency Lighting

35 Oxygen

- 35-20 Passenger
- 35-30 Portable

38 Water/Waste

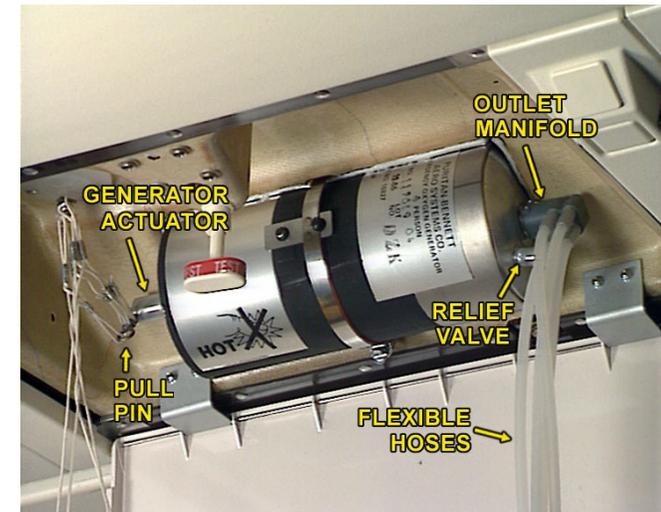
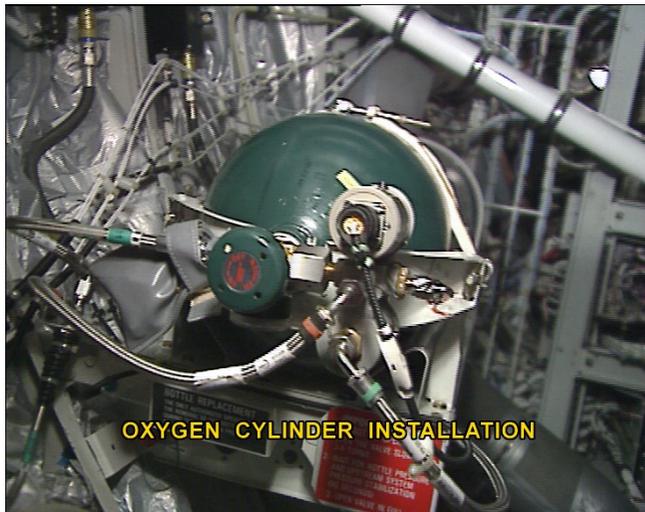
- 38-10 Potable water
- 38-20 Wash water
- 38-30 Waste Disposal
- 38-40 Air Supply



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ATA 35 Oxygen



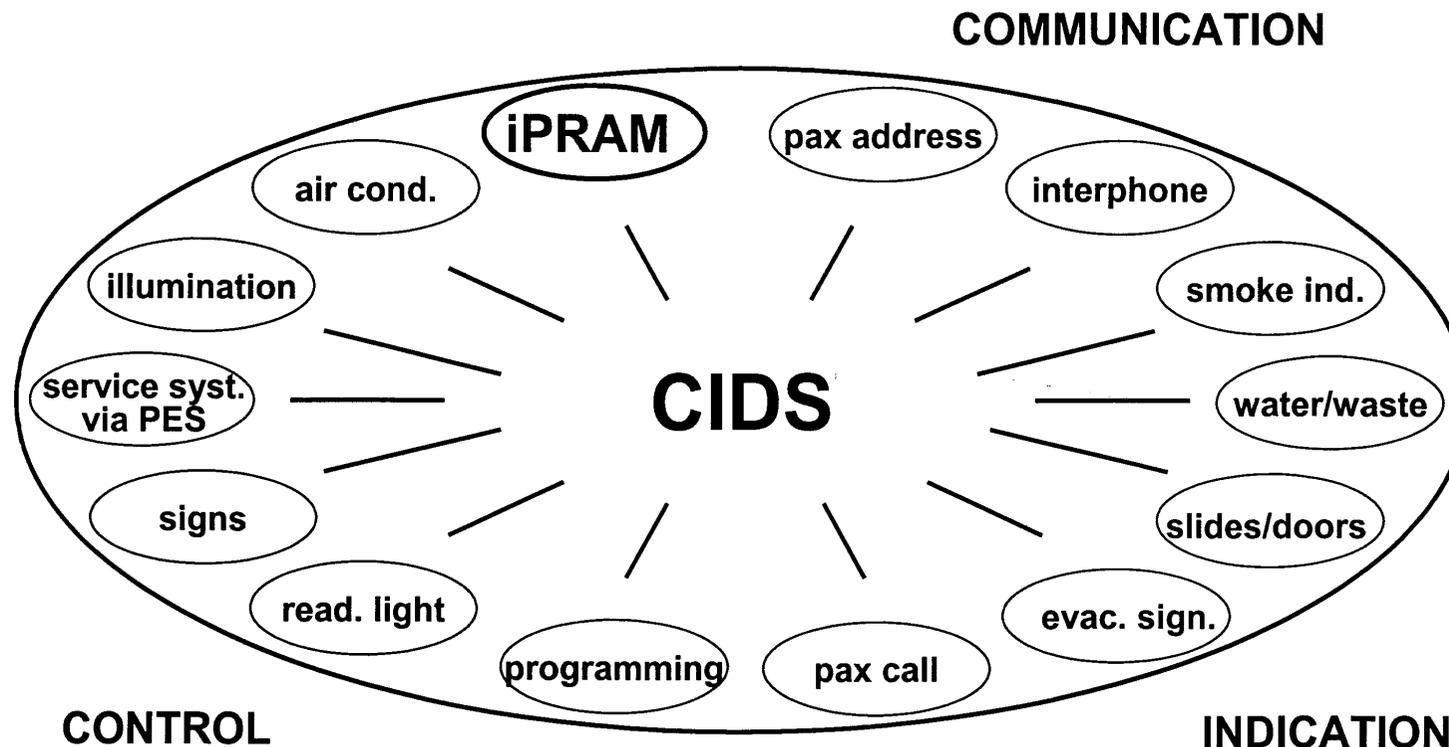
44 Cabin Systems (!!!)

- 44-10 Cabin Core System
- 44-20 Inflight Entertainment System
- 44-30 External Communication System
- 44-40 Cabin Mass Memory System
- 44-50 Cabin Monitoring System
- 44-60 Miscellaneous Cabin System

46 Information Systems

- 46-40 Passenger Cabin Information Systems
- 46-50 Miscellaneous Information Systems

Cabin electronics on Airbus A320, A330/A340, A380: Cabin Intercommunication Data System (CIDS)





50 Cargo and Accessory Compartments

- 50-10 Cargo Compartments
- 50-20 Cargo Loading Systems
- 50-30 Cargo Related Systems
- 50-50 Accessory Compartments
- 50-60 Insulation

52 Doors

- 52-10 Passenger/Crew
- 52-20 Emergency Exit
- 52-30 Cargo
- 52-40 Service and Miscellaneous
- 52-50 Fixed Interior
- 52-60 Entrance Stairs
- 52-70 Monitoring and Operation

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56 Windows

56-20 Passenger Compartment

56-30 Door



Aircraft Cabin & Cabin Systems – Buzz Words

- less weight, less maintenance, less costs, less waste/emissions
- more comfort: seats, beds, fitness room, bar, medical room
- more safety (crash safety, child restrain systems)
- cabin shows airline corporate identity: airlines want to differentiate themselves from other airlines (passenger identify their favorite airline)
- make use of your time on board:
in-flight entertainment (IFE) and passenger communication: video-on-demand, games, e-shopping, e-learning, internet,
data transfer, live TV, in-flight telephony, in-seat power (for laptop)
- special service for:
senior passengers, groups, children, women (orient), ...
- emotional travel experience by: design, light (mood lighting, stars)



Why Cabin & Cabin Systems? Aviation Centre Hamburg

- Aviation in Hamburg and northern Germany:
25000 employees
- 2 global players (Airbus and Lufthansa Technik):
21000 employees
- Hamburg is one of the biggest aeronautical centres in the world

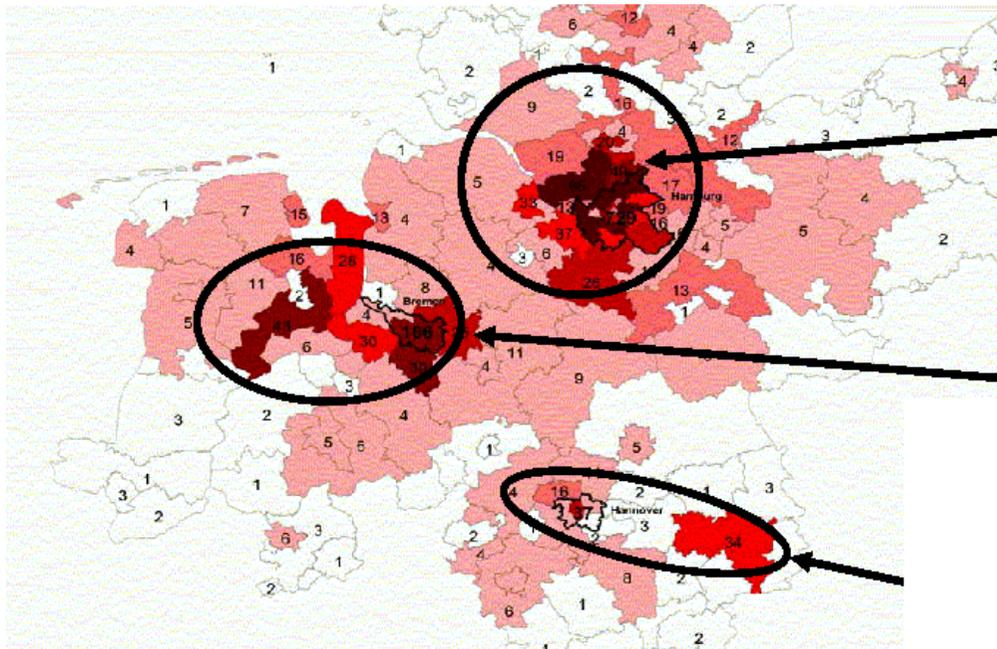
Importance of aviation topics in Hamburg:

1. structure
2. **cabin & cabin systems**
3. electrical and electronic equipment



(Data from year 2000 in core aviation business. Source: PFÄHLER 2003 see page 29)

Aviation Cluster Hamburg and its Metropolitan Region



Hamburg

Bremen

Hannover /
Braunschweig

- Europe will become a Europe of regions
- Regions cooperate: e.g. Hamburg with Midi-Pyrénées and Aquitaine in France

PFÄHLER, Wilhelm: Regionale Potenziale und Chancen eines Kompetenzclusters „Cabin Systems“:
In: *Workshop „Cabin Systems“*, 22.10.2003,
HAW Hamburg. Hamburg : Raum & Energie, 2003. –
<http://www.raum-energie.de/Home/MetropolregionHamburg/CabinSystems>

Special Semester Course "Cabin & Cabin Systems"

- Two courses have taken place:
 - Summer Semester 2003
 - Winter Semester 2003/2004
- Task: train non-aviation engineers in aircraft cabin & cabin systems
- Duration: one semester
- Participants employed by industry (and sent to HAW)
- Industry: Airbus and subcontractors
- Fees: 3240 EUR (EU sponsorship taken into account)
- Lecturers from industry participate in teaching
- Assessment: examinations (and course work)
- No formal degree (but certificate)



**Luftfahrtstandort
Hamburg**





Modules of Special Semester Course

Introduction to aeronautics : 80 h

Cabin architectures and certification: 40 h

Ergonomics and design: 40 h

Cabin modules and monuments: 60 h

Composites and sandwich technology: 40 h

Cabin systems: 90 h

Cabin system design: 40 h

System integration: 30 h

Total: 420 h

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Timetable of Special Semester Course

	Mo	Di	Mi	Do	Fr	Sa	So	Mo	Di	Mi	Do	Fr	Sa	So	Mo	Di	Mi	Do	Fr	Sa	So	Mo	Di	Mi	Do	Fr	Sa								
April	1	2	3	4	5	6		7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
Zeiten																																			
9.00-10.30	Intro	FPz	FPz	FPb				FPb	FPb	FPz	FPz	FPz			FPs	FPs	FPs	FPz								ED	KA	ED	ED			KA	ED	KA	
10.45-12.15	FPz	FPz	FPz	FPb				FPb	FPb	FPz	FPz	FPz			FPs	FPs	FPs	FPz								ED	KA	ED	ED			KA	ED	KA	
13.00-14.30																																			
14.45-16.15	FPz	FPz						FPb			FPz	FPz			FPs	FPs	FPs									ED	KA	ED	ED			KA	ED	KA	
KW	14				15				16				17				18																		
Mai		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
Zeiten																																			
9.00-10.30								KA	KA	KA	ED	ED			KS _w	KS _w	KS _s	KS _g	KS _b						KM _g	KM _g		FS	FS		KM _g	KM _g			
10.45-12.15								KA	KA	KA	ED	ED			KS _w	KS _g	KS _s	KS _g							KM _g	KM _g		FS	FS		KM _g	KM _g			
13.00-14.30								KA	KV		KV				KS _w	KS _g	KS _s	KS _g							KM _g	KM _g	FS	FS	FS		KM _g	KM _g	FS		
14.45-16.15								KA	KV		KV				KS _w	KV	KS _s	KV							KM _g	KM _g	FS	FS	FS		KM _g	KM _g	FS		
KW	18				19				20				21				22																		
Juni						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
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13.00-14.30																																			
14.45-16.15																																			
KW	23				24				25				26																						
Juli																																			
Zeiten																																			
9.00-10.30		SA	KS	KS	SI			SI	SI	SI	SI																								
10.45-12.15		SA	KS	KS	SI			SI	SI	SI	End																								
13.00-14.30																																			
14.45-16.15																																			
KW	27				28																														



FACHBEREICH FAHRZEUGTECHNIK UND FLUGZEUGBAU



Aufbaukurs Kabine/Kabinensysteme WS 03/04



Short Course "Cabin & Cabin Systems"

- 3-day short course
 - Integrated into German aerospace congress 2004
 - Congress cabin sessions integrated into short course
 - Free excess for students
 - Congress fees required for engineers from industry
 - Full participation needed in order to obtain certificate
 - No assessment
-
- More applications than available seats in the course.
 - 40 participants registered:
engineers from industry and students from all German aeronautical universities



<http://www.dglr.de>



Time Table of Short Course

Block	1	2	3	4
Zeit	09:05 - 10:20	10:45 - 12:50	14:40 - 15:55	ab 16:20
Dauer	1:15	2:05	1:15	-
Dienstag, 21.09.04	<i>D. Scholz</i> Einleitung <i>M. Seibel</i> Luftrecht	<i>M. Seibel</i> Kabinen- architekturen	<i>W. Granzeier</i> Ergonomie und Design	<i>W. Granzeier</i> Kabinenmodule und Monumente (bis ca. 18:25)
Mittwoch, 22.09.04	<i>Kongress- programm:</i> Kabine I	<i>Kongress- programm:</i> Kabine II	<i>M. Seibel:</i> Einbindung der Kabinenmodule in die Rumpfstruktur Faserverbund und Sandwichtechnologie	<i>W. Granzeier</i> Beleuchtung <i>D. Scholz</i> Elektronische Kabinensysteme (bis ca. 17:35)
Donnerstag, 23.09.04	<i>D. Scholz</i> Methoden der System- auslegung	<i>W. Bräunling</i> Mechanische Kabinensys- teme	<i>D. Scholz</i> Systemintegration	

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Short course lecture notes on CD

SCHOLZ, Dieter (Ed.): *Flugzeugkabine und Kabinensysteme*.
DGLR-Seminar, 21.-23.09.2004,
Bonn : Deutsche Gesellschaft für Luft- und Raumfahrt,
2004. – ISBN 3-932182-37-5,
available from DGLR, <http://www.dglr.de/literatur>



Degree Programme (BEng) "Cabin & Cabin Systems"

- Degree in Aeronautical Engineering
- Specialization:
 - **cabin & cabin systems**
 - aircraft design and structures
- Semester 1, 2 : common basic engineering teaching
- Semester 3...6: specialized teaching (with some common subjects)
- Semester 7: internship (industrial placement) with Bachelor-Thesis
- Teaching content dedicated to specialization: ~ 700 h
- Specialization module names: as given above



Summary and Conclusions

- Teaching material "cabin & cabin systems" created for:
 - Short course
 - Special semester course
 - Degree programme
- Short course and special semester course ran successfully
- Students have enrolled for degree programme

- Short course and special semester course were a good test for degree programme to follow
- HAW has earned good reputation