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

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

Hochschule für Angewandte Wissenschaften Hamburg
Hamburg University of Applied Sciences
Aircraft Cabin and Cabin Systems –
From Short Course to Degree Programme
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
Aircraft Cabin and Cabin Systems –
From Short Course to Degree Programme
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)
Aircraft cabin (Extended View)

- Seats: Design and Construction

Monuments: galleys and lavatories
• Hatracks

• Cabin layout: placement of cabin items
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
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
Aircraft Cabin and Cabin Systems – From Short Course to Degree Programme

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

Oxygen

ATA 35
Oxygen
ATA 38
Water / Waste
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
<table>
<thead>
<tr>
<th>Number</th>
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<tr>
<td>56</td>
<td>Windows</td>
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<td>56-20</td>
<td>Passenger Compartment</td>
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<tr>
<td>56-30</td>
<td>Door</td>
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</table>
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, life 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)
Europe will become a Europe of regions
Regions cooperate: e.g. Hamburg with Midi-Pyrénées and Aquitaine in France
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)
Aircraft Cabin and Cabin Systems – From Short Course to Degree Programme

Modules of Special Semester Course

Introduction to aeronautics: 80 h
Cabin architectures and certification: 40 h
Ergonomy and design: 40 h
Cabin moduls 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
# 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** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9.00-10.30 | Intro | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | ED | KA | ED | ED | KA | ED | KA |
| 10.45-12.15 | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | ED | KA | ED | ED | KA | ED | KA |
| 13.00-14.30 | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | ED | KA | ED | ED | KA | ED | KA |
| 14.45-16.15 | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | FPz | ED | KA | ED | ED | KA | ED | KA |
| **May** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9.00-10.30 | KA | KA | KA | KA | ED | ED | ED | KA | KA | KA | KA | KA | KA | KA | KA | KA | KA | KA | ED | ED | ED | KA | KA | KA | KA | KA |
| 10.45-12.15 | KA | KA | KA | KA | ED | ED | ED | KA | KA | KA | KA | KA | KA | KA | KA | KA | KA | KA | ED | ED | ED | KA | KA | KA | KA | KA |
| 13.00-14.30 | KA | KV | KV | KA | KA | KV | KV | KA | KA | KV | KA | KA | KV | KV | KA | KA | KV | KV | KA | KA | KV | KA | KA | KV | KV |
| 14.45-16.15 | KA | KV | KV | KA | KA | KV | KV | KA | KA | KV | KA | KA | KV | KV | KA | KA | KV | KV | KA | KA | KV | KA | KA | KV | KV |
| **June** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9.00-10.30 | KM | KM | KM | KM | FS | FS | FS | KM | KM | KM | KM | KM | KM | KM | KM | KM | KM | KM | FS | FS | FS | KM | KM | KM | KM | KM |
| 13.00-14.30 | KM | KM | FS | KM | FS | KM | KM | FS | KM | KM | KM | KM | KM | KM | KM | KM | KM | KM | FS | FS | FS | KM | KM | KM | KM | KM |
| **July** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **KW** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 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 | 32 |
Hochschule für Angewandte Wissenschaften Hamburg
Hamburg University of Applied Sciences

FACHBEREICHE 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
# Time Table of Short Course

<table>
<thead>
<tr>
<th>Block</th>
<th>1</th>
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<tr>
<td>Zeit</td>
<td>09:05 - 10:20</td>
<td>10:45 - 12:50</td>
<td>14:40 - 15:55</td>
<td>ab 16:20</td>
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<tr>
<td>Dauer</td>
<td>1:15</td>
<td>2:05</td>
<td>1:15</td>
<td>-</td>
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<td></td>
<td>M. Seibel: <strong>Luftrecht</strong></td>
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<td>Mittwoch, 22.09.04</td>
<td>Kongressprogramm:</td>
<td>Kongressprogramm:</td>
<td>M. Seibel: Einbindung der Kabinenmodule in die Rumpfstruktur</td>
<td>W. Granzeier: Beleuchtung</td>
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<tr>
<td></td>
<td>Kabine I</td>
<td>Kabine II</td>
<td></td>
<td>D. Scholz: Elektronische Kabinensysteme (bis ca. 17:35)</td>
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<tr>
<td>Donnerstag, 23.09.04</td>
<td>D. Scholz: Methoden der Systemauslegung</td>
<td>W. Bräunling: Mechanische Kabinensysteme</td>
<td>D. Scholz: Systemintegration</td>
<td></td>
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</tbody>
</table>
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: \( \sim 700 \) 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