Teaching Aeronautical Engineering with A320 System Simulators

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Content

• Introduction
  – Aero – Aircraft Design and Systems Group
  – MTD – Maintenance Training Device

• Two MTDs for the University

• Simulator Exercise
  – Cockpit Panels
  – Aircraft Systems
  – Simulator in Action

• Application of the Simulator

• Conclusions
Introduction – Aero

• Aero is Home of the Airbus A320 System Simulators

• Aero is Part of ...
  – Hamburg University of Applied Sciences (HAW Hamburg)
  – the Faculty of Engineering and Computer Science
  – the Research Focal Point Aeronautical Engineering
  – the Department of Automotive & Aeronautical Engineering

• Aero's aim is to
  – guide research assistants to cooperative dissertations
  – to conduct funded projects in research, development and teaching

• Aero's Aeronautical Disciplines
  – Aircraft Design
  – Aircraft Systems
  – Flight Mechanics
Introduction – Aero

Aero – Main Office
Introduction – Aero

Aero – Looking towards the Simulators
Introduction – Aero

Simulator Room with Computer Based Training (CBT) Stations
Introduction – Aero

Two identical Simulators and the Instructor Operating Station (IOS)
Aero's Projects:

• Current projects:
  – GF: Green Freighter
  – ALOHA: Aircraft Design for Low Cost Ground Handling
  – Efficient Airport 2030 (Hamburg Research Cluster)
  – PAHMIR: Preventive Aircraft Health Monitoring
  – MOZART: Health Monitoring of Fuel Cells in Aviation
  – CARISMA: Cabin and Cabin System Refurbishing

• Finished projects:
  – FLECS: Functional Library of the ECS
Aero's Short Courses
- Duration: One Week
- Part of EPMA
- Funding: Private

1.) Aircraft Design
- 3 runs so far; next short course: 25th to 29th May 2009
- Participants (from university and industry): international
- Lecturers: Airbus and aviation experts

2.) Introduction to Aeronautical Engineering
- 7 runs so far; next short course: August 2009
- Lecturers: International participation
Introduction – MTD

Computer Applications in Aviation Training
  – Pilot Training

![Training Pyramid]

- **FFS** Full Flight Simulator
- **FTD** Flight Training Devices:
  - **FBS** Fixed Based Simulator
  - **PPT** Part Task Trainer
  - **CSS** Cockpit System Trainer
  - **IFF** Instrument Flight Trainer
- **CBT** Computer Based Training
Introduction – MTD

Computer Applications in Aviation Training
  – Aviation Maintenance Training

MTS = MTD: Maintenance Training Device
Two MTDs for the University

Students Regularly Invited at Airbus for MTD Training
Two MTDs for the University

The New Generation of MTDs at Airbus Training
Two MTDs for the University

Moving Two MTDs to the University
Two MTDs for the University

Official Hand Over to the University
Hochschule für Angewandte Wissenschaften Hamburg

Pressemitteilung und Einladung

Airbus schenkt der HAW Hamburg zwei A320 Simulatoren


Two MTDs for the University

Integrating the MTDs into Aero's New Office
Exercise – Cockpit Panels

A319/A320/A321 flight deck – plan view

- Capt. sidestick
- Capt. nav. bag
- 4th occupant seat (optional)
- Coat stowage
- F/O sidestick
- F/O nav. bag
- 3rd occupant seat

- An observer seat aft of the pedestal offers maximum visibility over all panels.
- A fourth occupant seat is offered as an option.

The A320 Cockpit
Exercise – Cockpit Panels

Location of the Cockpit Panels
Exercise – Cockpit Panels

Overhead Panel
Exercise – Cockpit Panels

Main Panel
Exercise – Cockpit Panels

Detail of Main Panel
Exercise – Cockpit Panels

Center Pedestal
Exercise – Cockpit Panels

A319/A320/A321 EIS – ECAM control / switching panels

ECAM Control Panel
## Exercise – Aircraft Systems

<table>
<thead>
<tr>
<th>identifier</th>
<th>name of system</th>
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</thead>
<tbody>
<tr>
<td>21</td>
<td>air conditioning</td>
</tr>
<tr>
<td>22</td>
<td>auto flight</td>
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<tr>
<td>23</td>
<td>Communications</td>
</tr>
<tr>
<td>24</td>
<td>electrical power</td>
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<tr>
<td>25</td>
<td>equipment / furnishings</td>
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<tr>
<td>26</td>
<td>fire protection</td>
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<tr>
<td>27</td>
<td>flight controls</td>
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<td>Fuel</td>
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<td>29</td>
<td>hydraulic power</td>
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<tr>
<td>30</td>
<td>ice &amp; rain protection</td>
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<tr>
<td>31</td>
<td>indicating / recording systems</td>
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<tr>
<td>32</td>
<td>landing gear</td>
</tr>
<tr>
<td>33</td>
<td>Lights</td>
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<tr>
<td>34</td>
<td>Navigation</td>
</tr>
<tr>
<td>35</td>
<td>Oxygen</td>
</tr>
<tr>
<td>36</td>
<td>Pneumatic</td>
</tr>
<tr>
<td>38</td>
<td>water / waste</td>
</tr>
<tr>
<td>49</td>
<td>airborne auxiliary power</td>
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</tbody>
</table>

Aircraft Systems by ATA Chapter

25
Exercise – Aircraft Systems

Literature:

THE STANDARD HANDBOOK FOR AERONAUTICAL AND ASTRONAUTICAL ENGINEERS

Editor in Chief:
Mark Davies
University of Limerick

Publisher:
McGraw-Hill, New York

Commissioning Editor:
Shelley Carr

with section on Aircraft Systems (100 pages) by Dieter Scholz
Exercise – Simulator in Action

Optimum: Two Students Sharing one Simulator
Exercise – Simulator in Action

The Simulator's First Window on Start Up
Exercise – Simulator in Action

The Simulator's Second Window on Start Up
Exercise – Simulator in Action

The Center Pedestal of the Simulator

Mouse for Simulator Control

Printer as on Aircraft
Exercise – Simulator in Action

Simulators connect to IOS via Ethernet

- Init Load
- Reset
- Airport Selection Page
- Malfunctions Index
- Init Flight

Instructor Operating Station (IOS) Main Window
Exercise – Simulator in Action

Providing the Aircraft with Electric Ground Power
Exercise – Simulator in Action

Overhead Panel ("ANN LT TEST ")
Exercise – Simulator in Action

Landing Gear Panel ("ANN LT TEST ")
Exercise – Simulator in Action

Primary Flight Display
Exercise – Simulator in Action

APU Start with External Power

Fuel On Board (ECAM E/WD)  
- There should be at least 3000kgs/7000lbs of fuel on board

FUEL PUMPS  
ON

APU FIRE Pushbutton  
In/Guarded

- SQUIB and DISCH lights extinguished.

APU FIRE Test  
PERFORM

- Check:
  - APU FIRE light illuminated.
  - SQUIB and DISCH lights illuminated.
  - MASTER WARNING illuminated. APU FIRE warning on ECAM E/WD.
  - ECAM APU page appears.
  - CRC sounds.

APU MASTER Switch  
PRESS

Always: Working with the Check List
Exercise – Simulator in Action

ECAM Control Panel and System Display – Here: Engine Page
Exercise – Simulator in Action

System Display – Electric and Air Conditioning Page
Exercise – Simulator in Action

Introducing Failure Cases on the IOS
Exercise – Simulator in Action

Failure Indication on ECAM
Application of the Simulator

- Practical work related to selected lectures:
  - Aircraft Systems
  - Aircraft Engines (Propulsion)
- Getting students involved
- External courses
- University events
  - Girls Day
  - University Open Days
  - ...
- General Interest: Media, Visitors, ...
- Generating Income for the University:
  Professional Event Managing
Conclusions

- Students like the simulator (payback for their fees)
- Provides hands on experience
- Many other possible ways to use the simulator
Thank you for your attention!

For further information see
http://Simulator.ProfScholz.de