



Hochschule für Angewandte Wissenschaften Hamburg
Hamburg University of Applied Sciences



Teaching Aeronautical Engineering with A320 System Simulators

Dieter Scholz

Hamburg University of Applied Sciences

EWADE 2009

9th European Workshop on Aircraft Design Education

Sevilla, Spain, 12.-15.05.2009

EWADE2009-Scholz

- **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**

- **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

CBT



Simulator Room with Computer Based Training (CBT) Stations

Introduction – Aero

IOS



Two identical Simulators and the Instructor Operating Station (IOS) 7

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
 - EPMA: European Professional Master in Aeronautical Eng.

Aero's Short Courses

- Duration: One Week
- Part of EPMA
- Funding: Private



1.) Aircraft Design

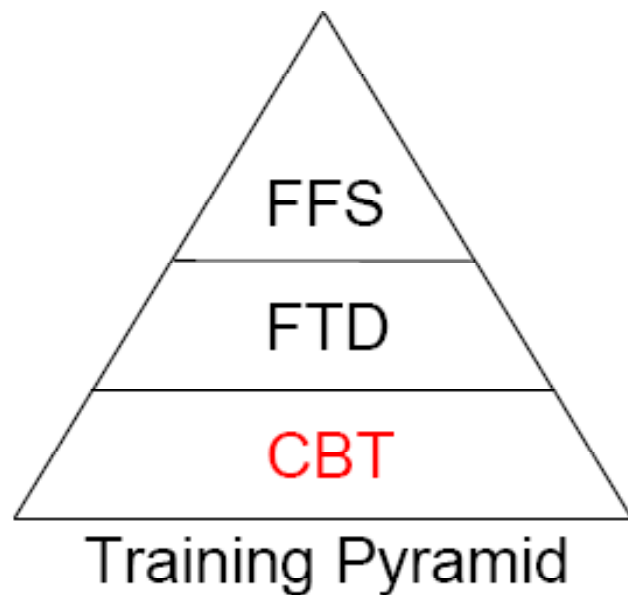
- 3 runs so far; next short course: 25th to 29th May 2009
- Participants (from university and industry): international
- Lecturers: Airbus and aviation experts

2.) Introduction to Aeronautical Engineering

- 7 runs so far; next short course: August 2009
- Lecturers: International participation

Computer Applications in Aviation Training

– Pilot Training



FSS Full Flight Simulator

FTD Flight Training Devices:

FBS Fixed Based Simulator

PPT Part Task Trainer

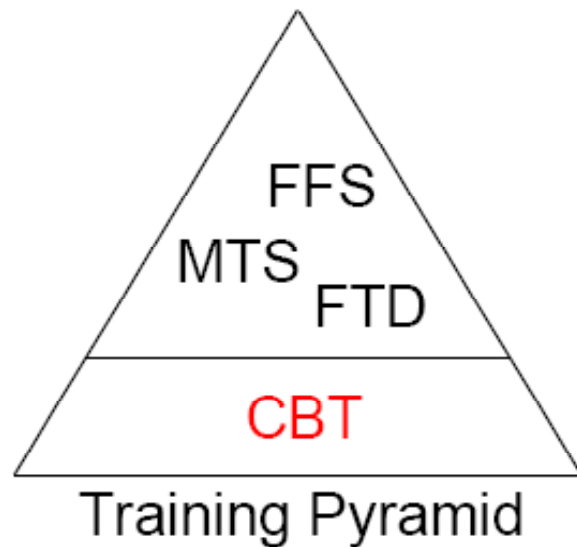
CSS Cockpit System Trainer

IFF Instrument Flight Trainer

CBT Computer Based Training

Computer Applications in Aviation Training

– Aviation Maintenance Training



FSS Full Flight Simulator

MTS Maintenance Training Simulator

FTD Flight Training Device

CBT Computer Based Training

MTS = MTD: Maintenance Training Device

Two MTDs for the University



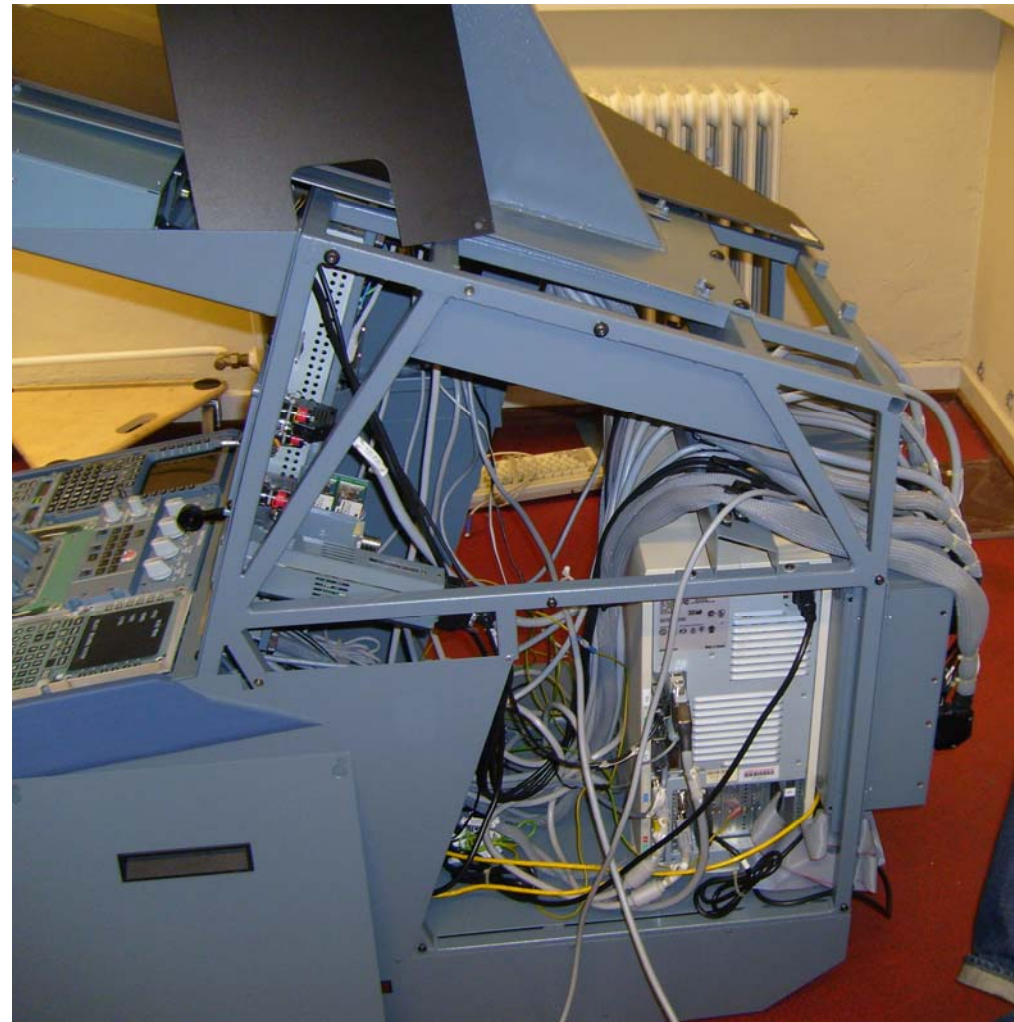
Students Regularly Invited at Airbus for MTD Training

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

15. November 2007

Pressemitteilung und Einladung

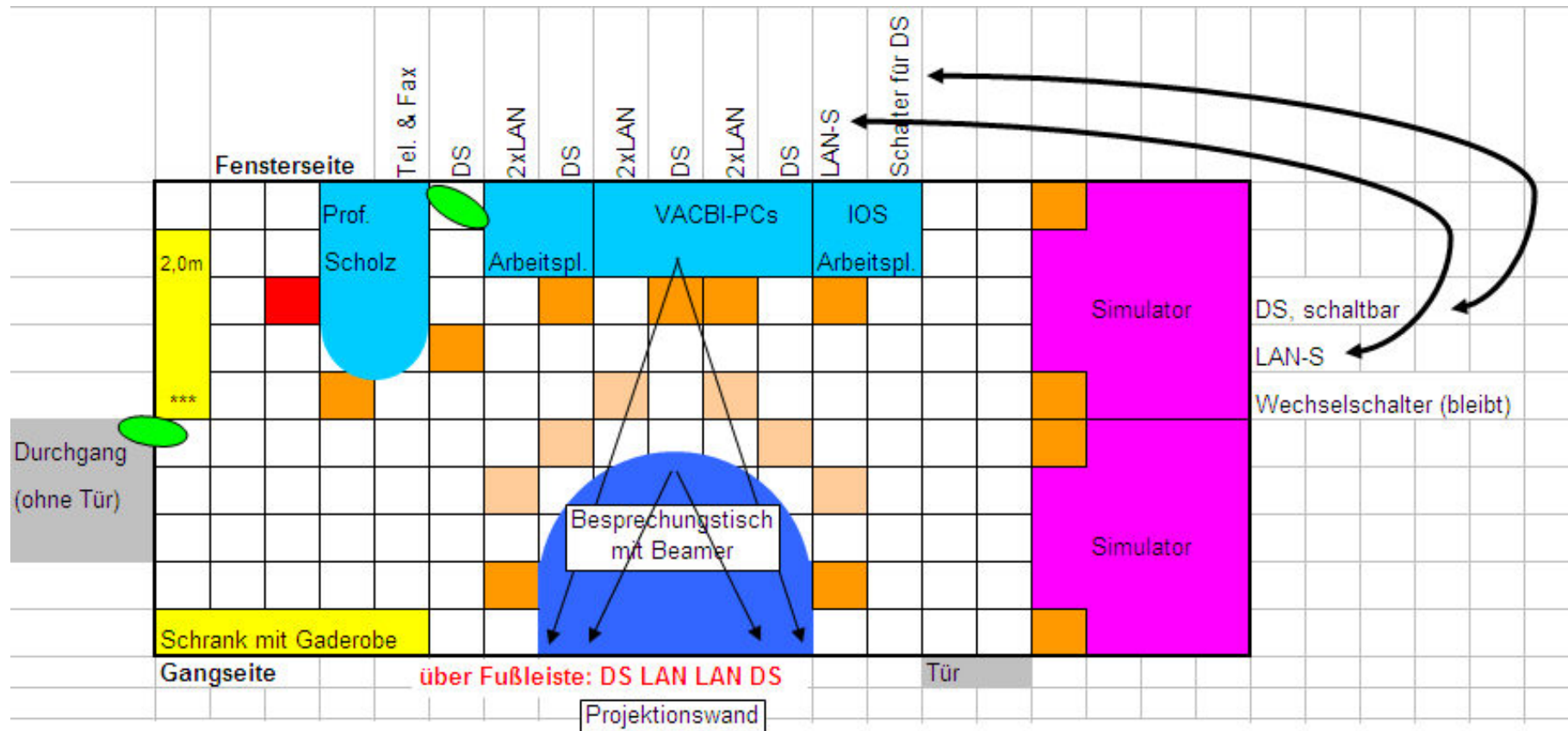
Airbus schenkt der HAW Hamburg zwei A320 Simulatoren

– Airbus schenkt der Hochschule für Angewandte Wissenschaften Hamburg am kommenden Montag, den 19. November 2007, zwei Airbus A320 Simulatoren für die luftfahrtbezogene Ausbildung der Studierenden –

Der Leiter von Airbus Training Hamburg, Dipl.-Ing. Thorsten Behrendt, wird die Geräte an den Präsidenten der HAW Hamburg, Prof. Dr. Michael Stawicki, übergeben. Sie werden künftig betreut von Prof. Dr. Dieter Scholz, Leiter der Aircraft Design and System Group (Aero) im Department Fahrzeugtechnik und Flugzeugbau. Studenten der Vorlesung Flugzeugsysteme werden in Zukunft Laborübungen am Simulator durchführen können. Die MTD's helfen den Studenten, ein besseres Verständnis der Flugzeugsysteme zu erlangen und praktische Erfahrungen am Flugzeug zu sammeln. Aufgaben für die Studenten sind dabei u.a. die Inbetriebnahme des Flugzeugs, der Start der Triebwerke und die Überwachung der Systeme im Flug. Weiterhin kann in einem simulierten Wartungsbetrieb die Fehlersuche geübt werden und das Auslesen von Wartungsdaten aus den Bordcomputern.

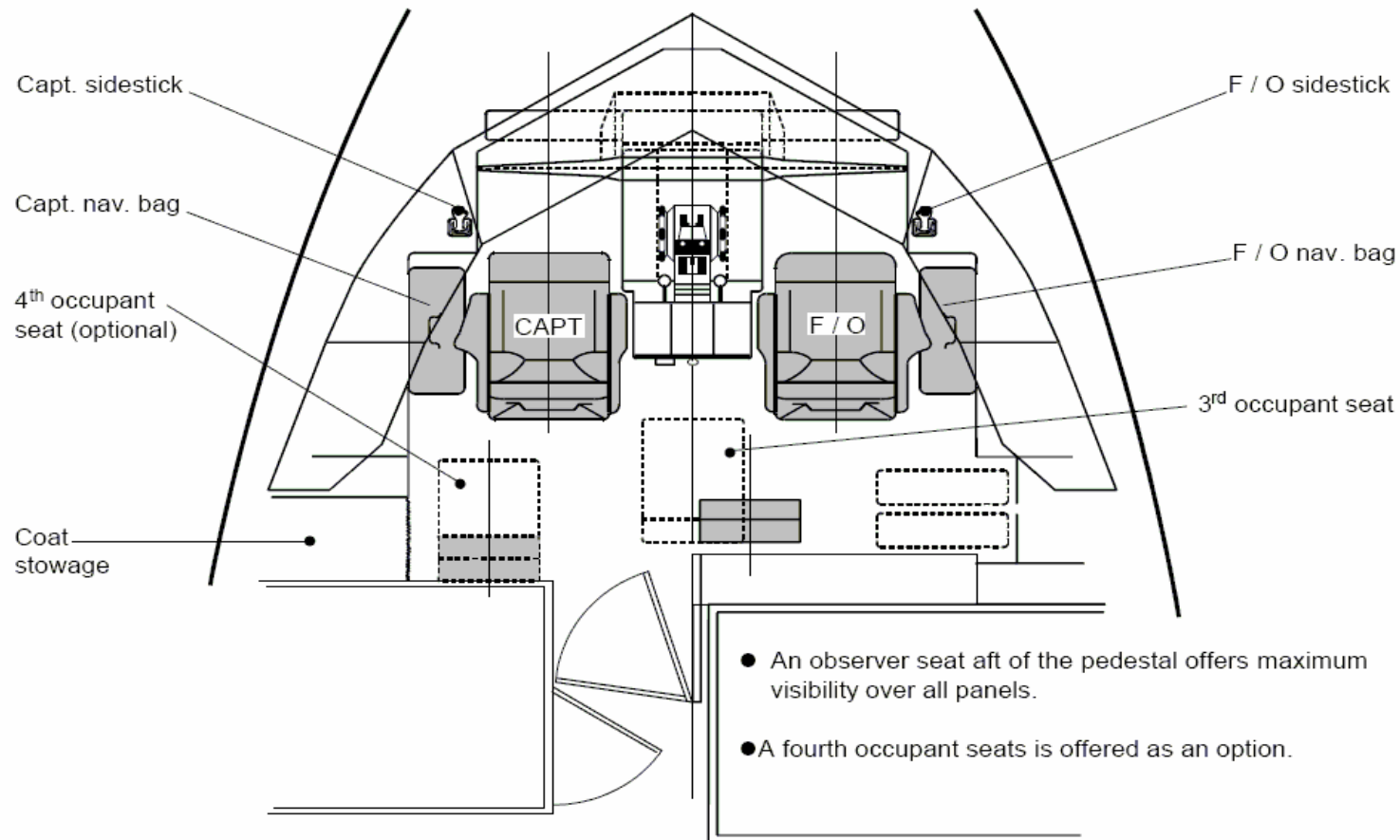
Die MTD's sind gegenüber einem Flugsimulator (Full Flight Simulator, FFS) etwas einfachere Geräte ohne Bewegungs- und Sichtsimulation. Ein MTD besteht aus einem fast vollständigen Cockpit mit zum großen Teil echten Cockpitkomponenten und wird teilweise mit der gleichen Software betrieben wie der Flugsimulator. Aufgabe der MTD's ist insbesondere die Simulation des Verhaltens der Flugzeugsysteme und Triebwerke. Airbus Training betreibt in Hamburg zwei MTD's vom gleichen Typ. Nach Aussage des Herstellers ECA FAROS haben sie einen Wert von 900.000 €.

Two MTDs for the University

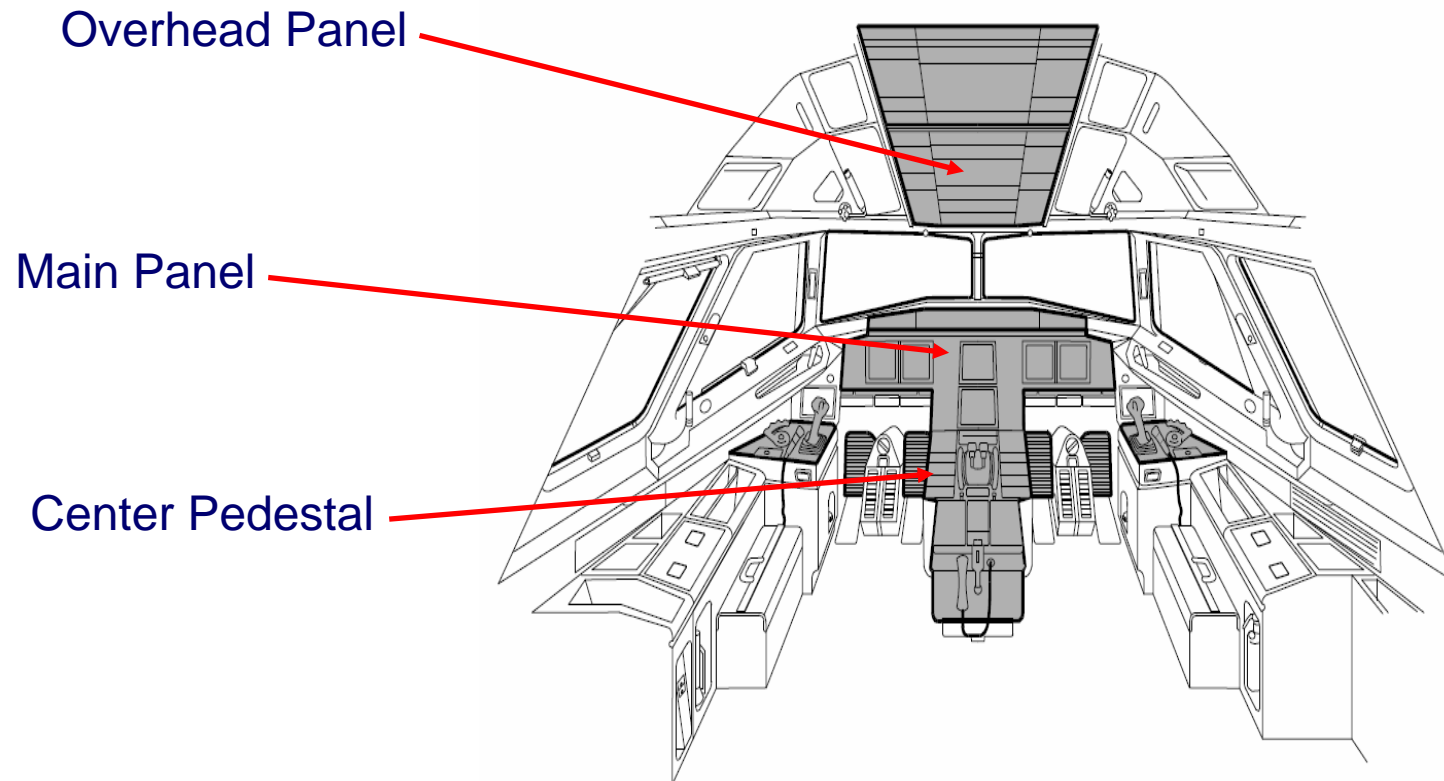


Exercise – Cockpit Panels

⊙ A319/A320/A321 flight deck – plan view

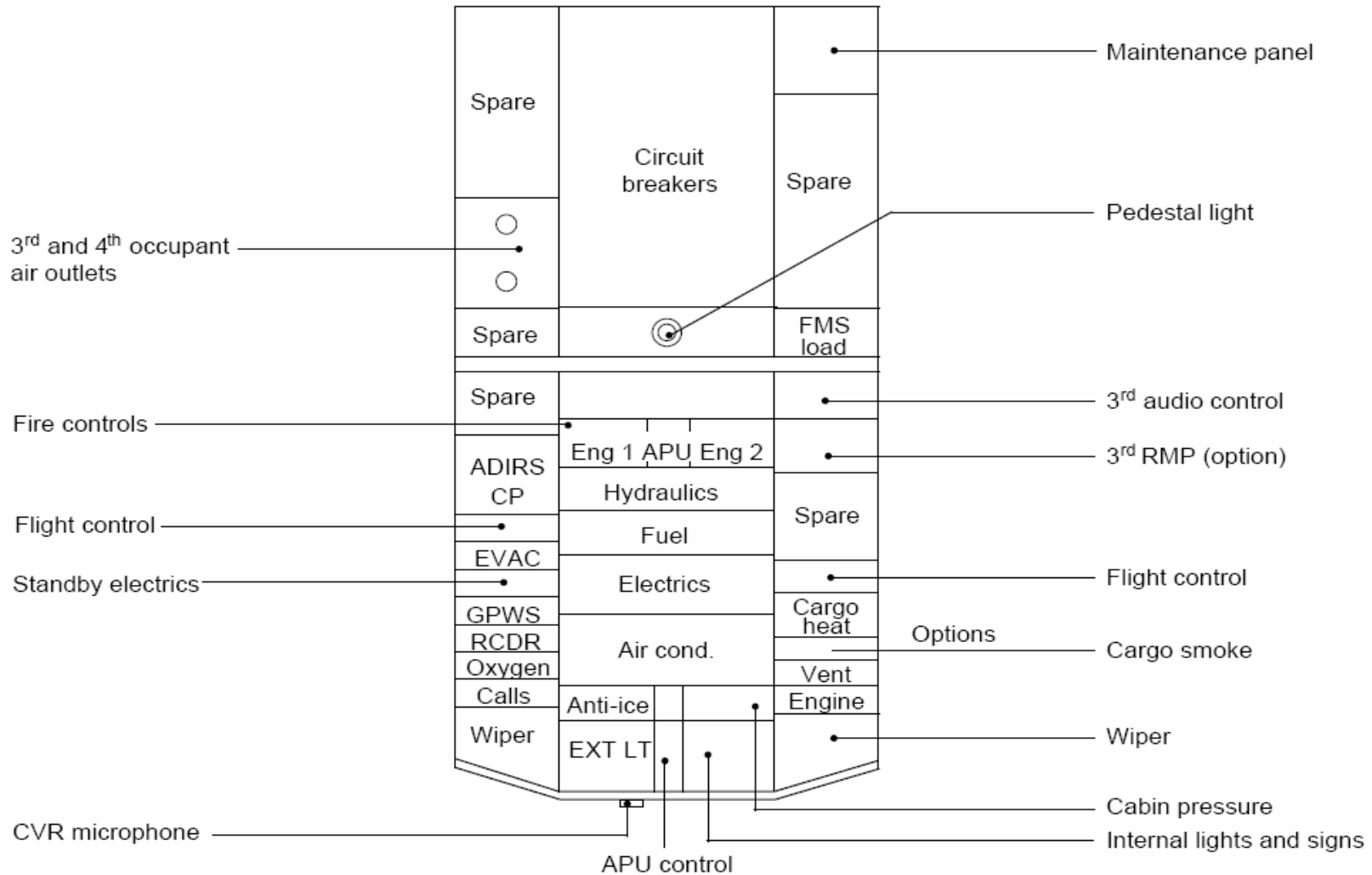


Exercise – Cockpit Panels



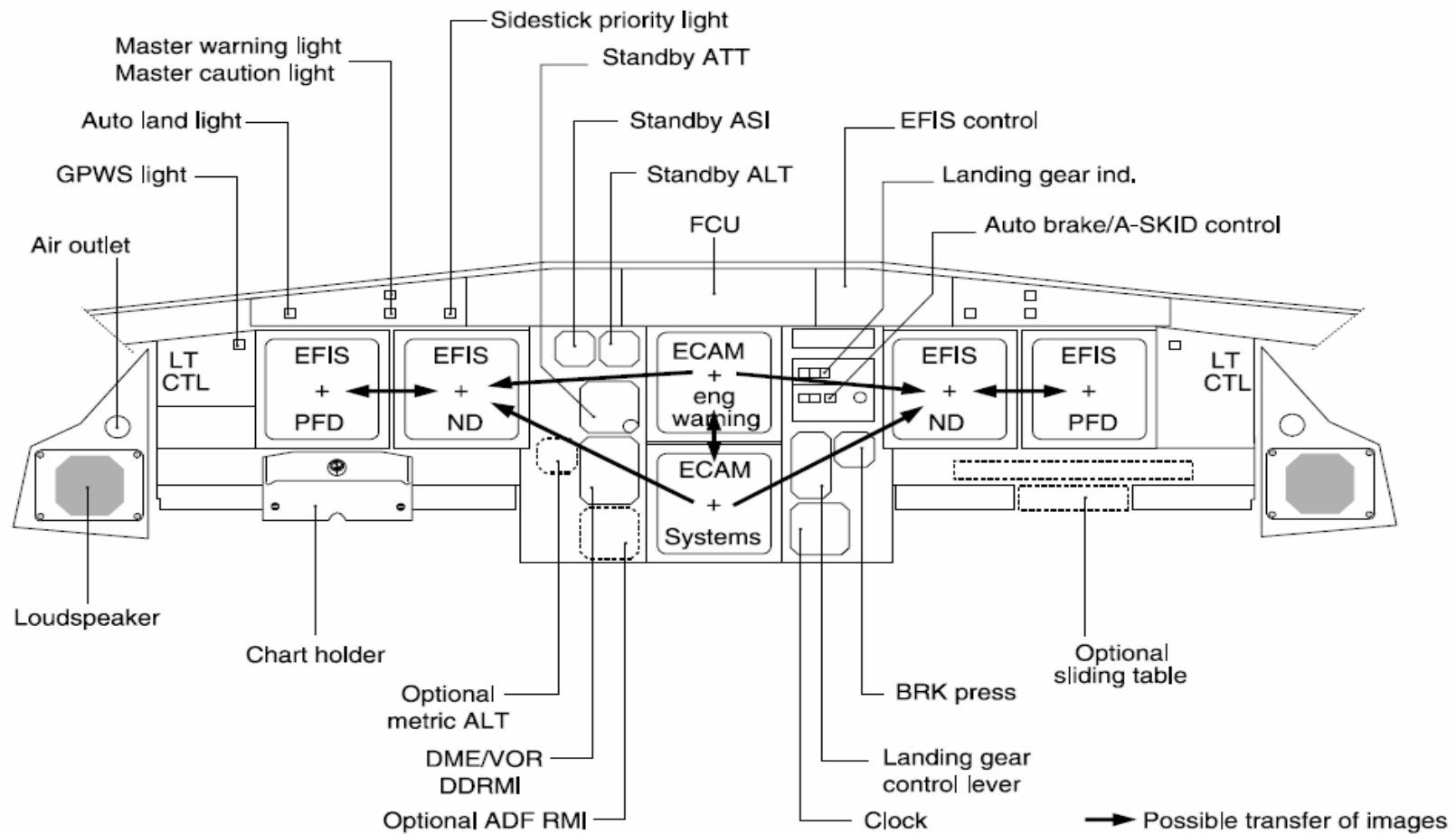
Location of the Cockpit Panels

Exercise – Cockpit Panels



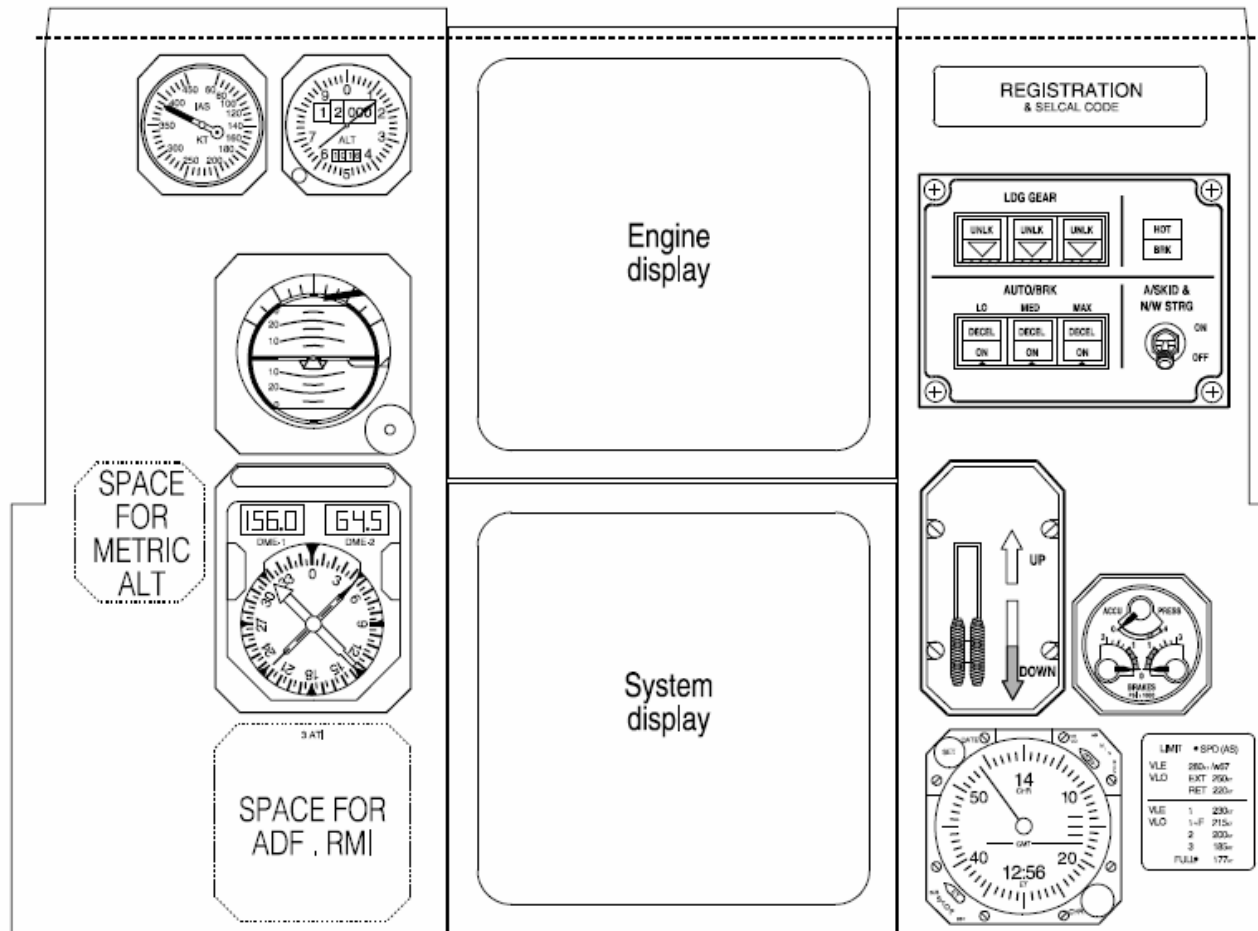
Overhead Panel

Exercise – Cockpit Panels



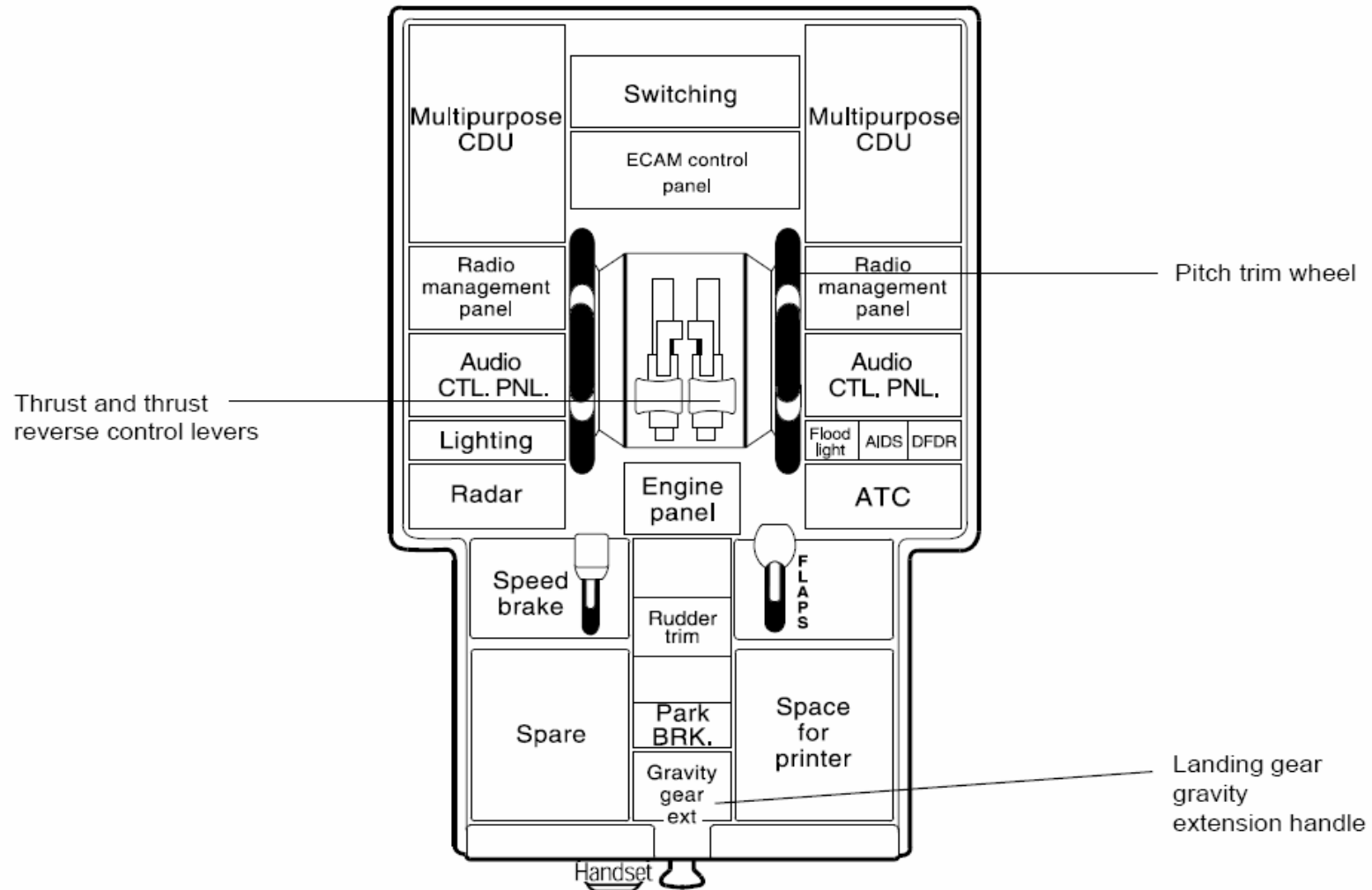
Main Panel

Exercise – Cockpit Panels



Detail of Main Panel

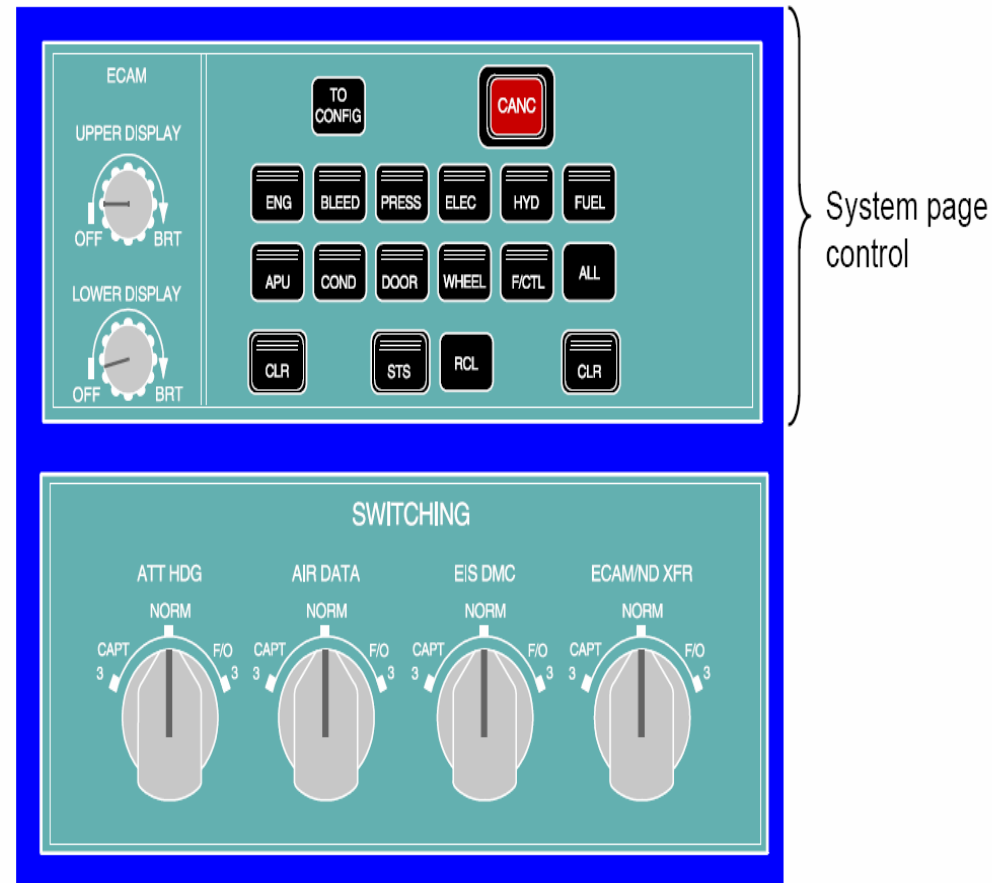
Exercise – Cockpit Panels



Center Pedestal

Exercise – Cockpit Panels

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



ECAM Control Panel

Exercise – Aircraft Systems



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

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

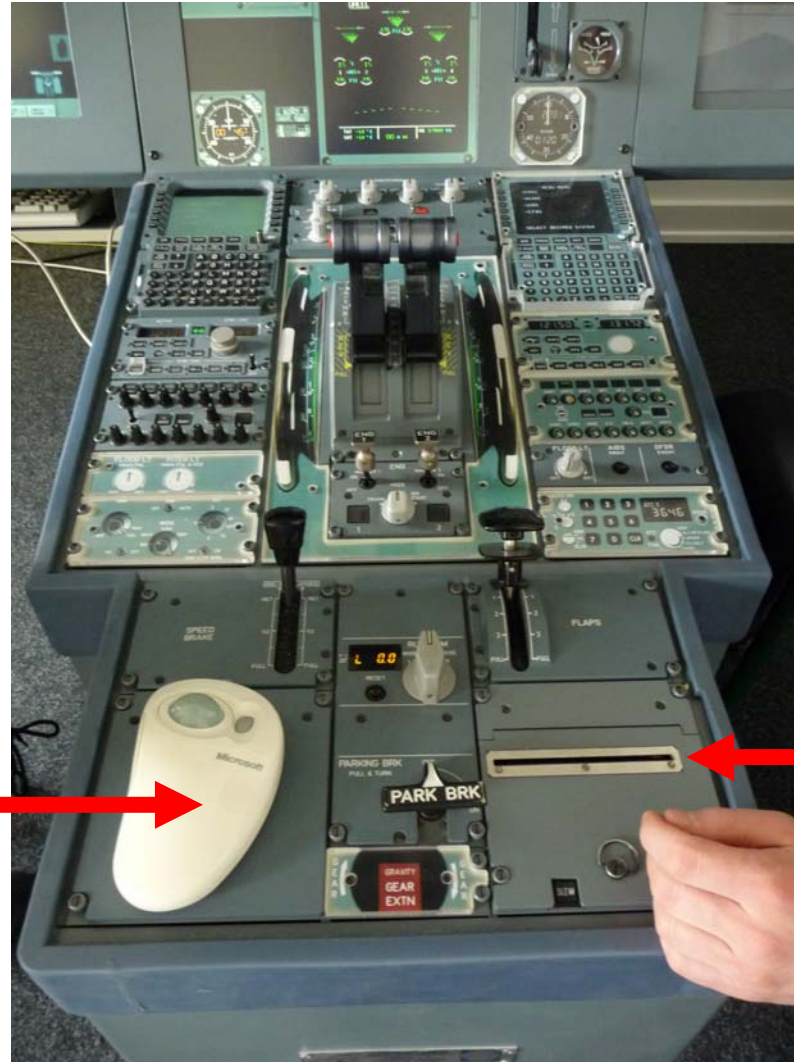
Exercise – Simulator in Action



The Simulator's Second Window on Start Up

Exercise – Simulator in Action

Mouse for
Simulator Control

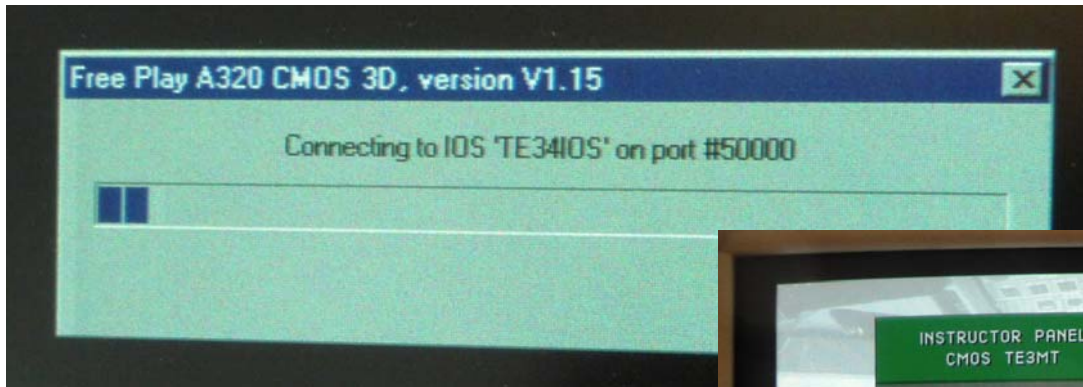


Printer as on
Aircraft



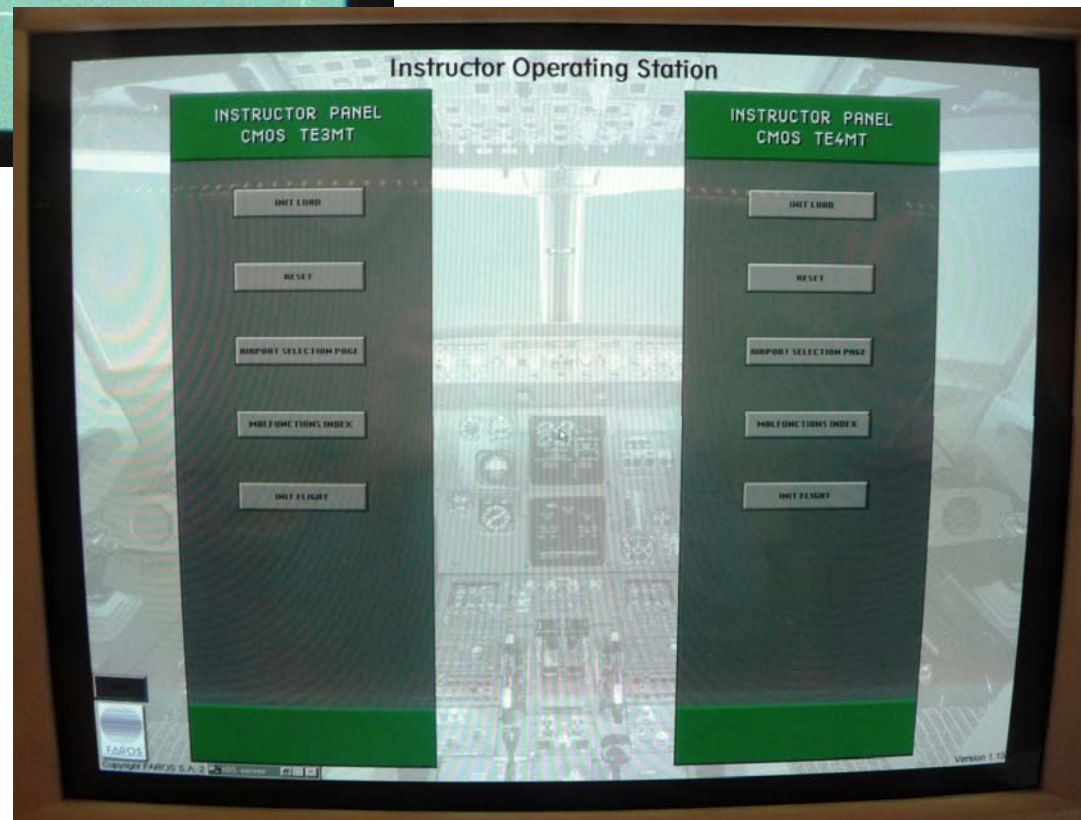
The Center Pedestal of the Simulator

Exercise – Simulator in Action

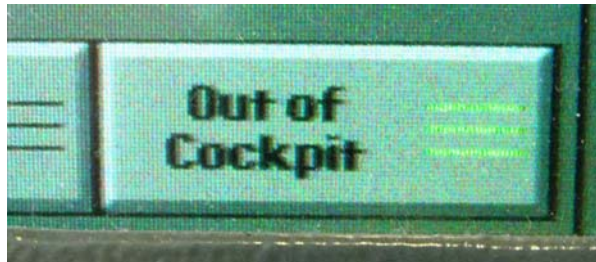


Simulators connect to
IOS via Ethernet

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



Exercise – Simulator in Action



Providing the Aircraft with Electric Ground Power

Exercise – Simulator in Action



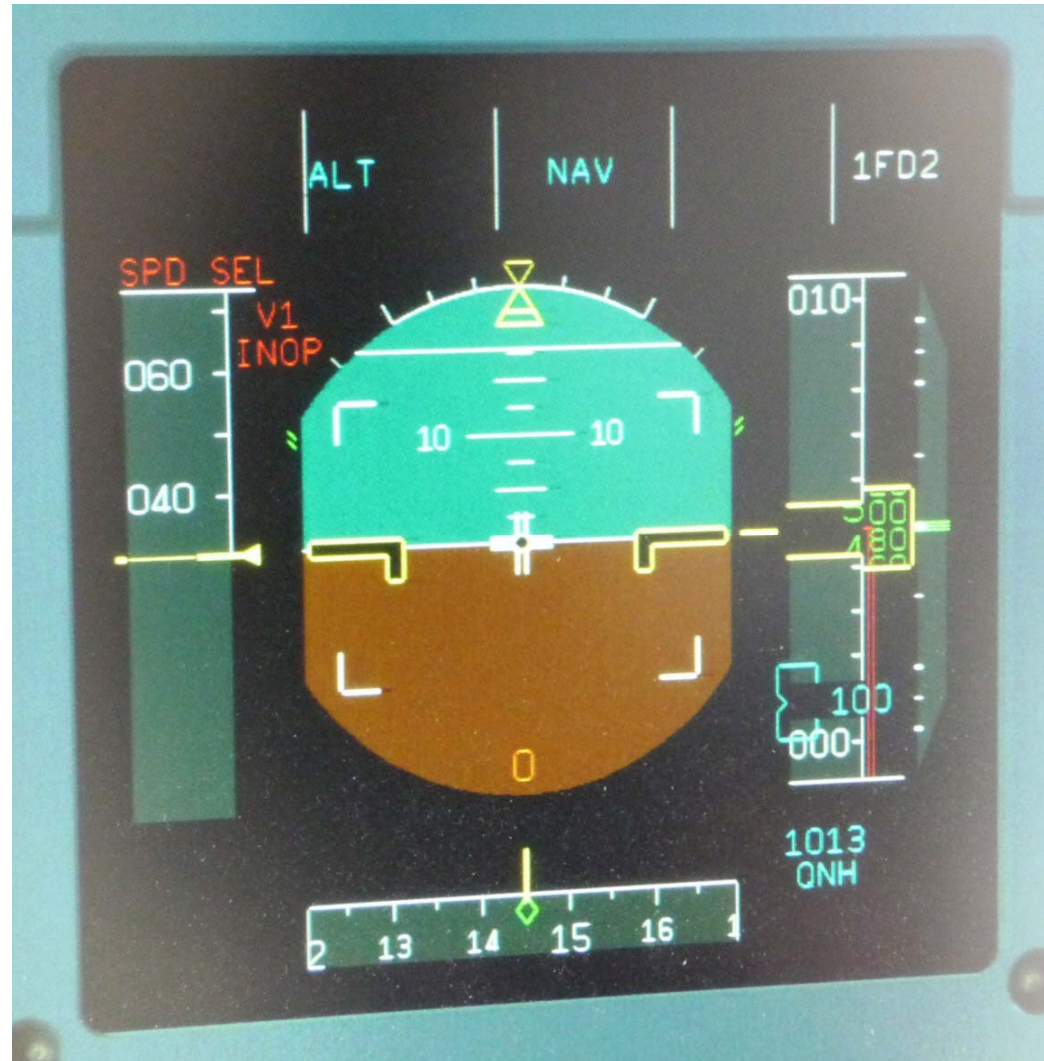
Overhead Panel ("ANN LT TEST ")

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)

NOTE

- 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

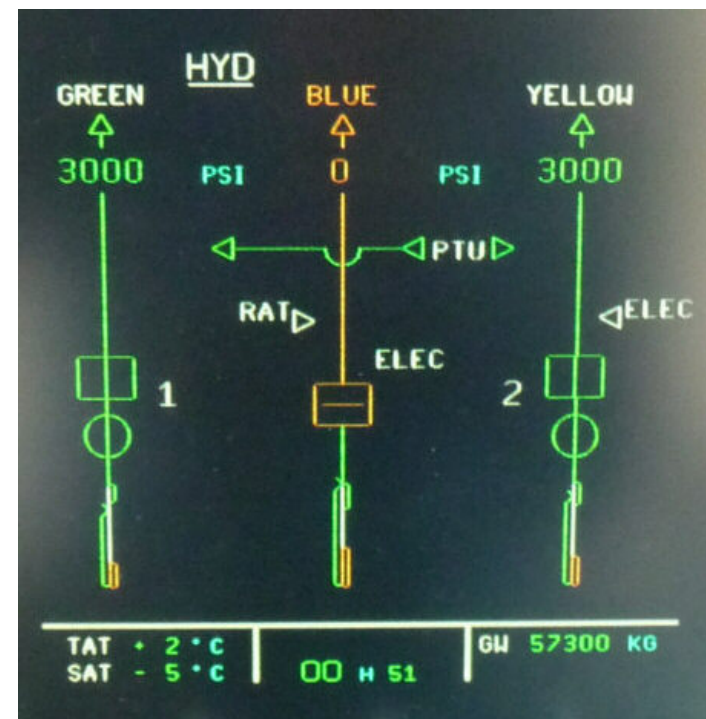
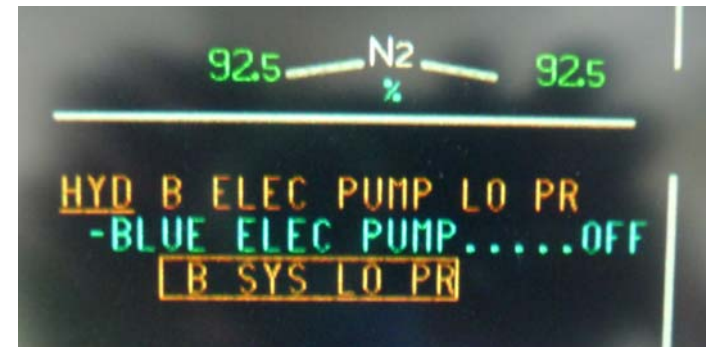


Exercise – Simulator in Action



Introducing Failure Cases on the IOS

Exercise – Simulator in Action



Failure Indication on ECAM

- **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>**