university of applied sciences
gegr. 1970 fachhochschule hamburg
AUTOMOTIVE AND AEROSPACE ENGINEERING
Course in Aerospace Engineering

COMPUTER BASED TRAINING IN AIRCRAFT DESIGN EDUCATION

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Contents

Introduction

Computer Based Training

Definition:

Computer based training (CBT) is
"the use of computers
to provide an interactive instructional experience"
in which the computer is seen
"as the primary mode of instruction".

Aviation Industry CBT Committee: *Glossary of terms*

Introduction

Computer Based Training

Characteristics:

CBT is:

- interactive
- self-directed
- self-paced

CBT often includes:

- hypertext
- multimedia elements
- hypermedia

Classification:

- Student-paced CBT ("the original CBT")
- Instructor-lead CBT

Introduction

Computer Based Training

Other acronyms for CBT:

CAI	computer assisted instruction
CAL	computer aided learning
CBE	computer based education
CBI	computer based instruction
CBL	computer based learning

. . .

Introduction

Economic Problems

Costs for the development of a CBT training course (duration **one hour**):

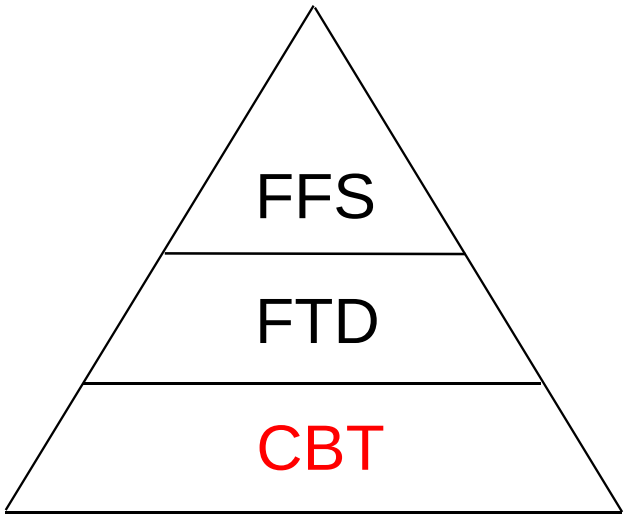
- PLATO, Lilienthal Project, ... : ≈ 25 000 US$

⇒ Development costs must be distributed over a large number of students.

! Usually there is a small number of students in aircraft design.

Computer Applications in Aviation Training

Pilot Training



Training Pyramid

FSS **Full Flight Simulator**

FTD **Flight Training Devices:**

FBS Fixed Based Simulator

PPT Part Task Trainer

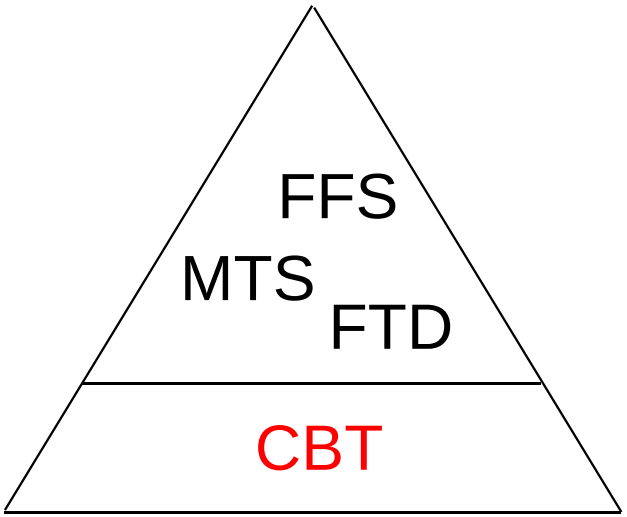
CSS Cockpit System Trainer

IFF Instrument Flight Trainer

CBT **Computer Based Training**

Computer Applications in Aviation Training

Aviation Maintenance Training



Training Pyramid

FSS **Full Flight Simulator**
MTS **Maintenance Training Simulator**
FTD **Flight Training Device**

CBT **Computer Based Training**

Computer Applications in Aviation Training

Aviation Maintenance Training

CBT levels:

- Aircraft maintenance fundamentals
- Generic aircraft systems concepts
- Aircraft type-specific maintenance
- Troubleshooting by means of simulation-type CBT

Computer Applications in Aviation Training

Aviation Maintenance Training

Lessons learned:

- CBT does not provide a total training solution.
- Use a mix: lectures, CBT, practical training, field trips.
- Pure student-paced CBT does not work.
- Limit student-paced CBT to 3 hours per day.
- The human brain is no storage area.
- Provide easy-to-use retrieval systems.

Computer Applications in Aviation Training

Other Branches of Aviation Training

- Cabin crew training
- X-ray interpretation training
- General topic training:
  - Safety
  - Emergency
  - Security

Computer Applications in Aviation Training

CBT Developers

Dedicated CBT developers

- Vega Group PLC
- Wicat Systems Inc.

Aircraft Manufacturers

- Airbus Industrie
- FlightSafety Boeing Training International

Airlines (in cooperation with partners ↑)

Requirements and Background: CBT in Aircraft Design Education

Requirements (problem-based learning, PBL)

- Student-paced CBT on aircraft design fundamentals
- Computing modules on
  - preliminary sizing
  - conceptual aircraft design
- Ideally: Elements of simulation-type CBT
- CBT usable via Internet ⇒
  - Web Based Training (WBT)
  - Distance Learning
- Discussion groups, E-mail support

Requirements and Background: CBT in Aircraft Design Education

Traditional Aircraft Design Computer Programs

- Advanced Aircraft Analysis (AAA)
- RDS Aircraft Design Software

PC-based Flight Simulation (Fly your aircraft !)

- X-Plane with 'planemaker'
- Aviator Visual Design Simulator (AVDS)

RASMUSSEN SIMULATION TECHNOLOGIES LIMITED

CBT Tools

Microsoft

- Word
- PowerPoint
- Excel

Adobe Portabel Document Format (PDF)

- Acrobat Exchange
- Acrobat Reader

HTML, JavaScript, Java

Macromedia

- Director

First Results

University of Applied Sciences, Hamburg

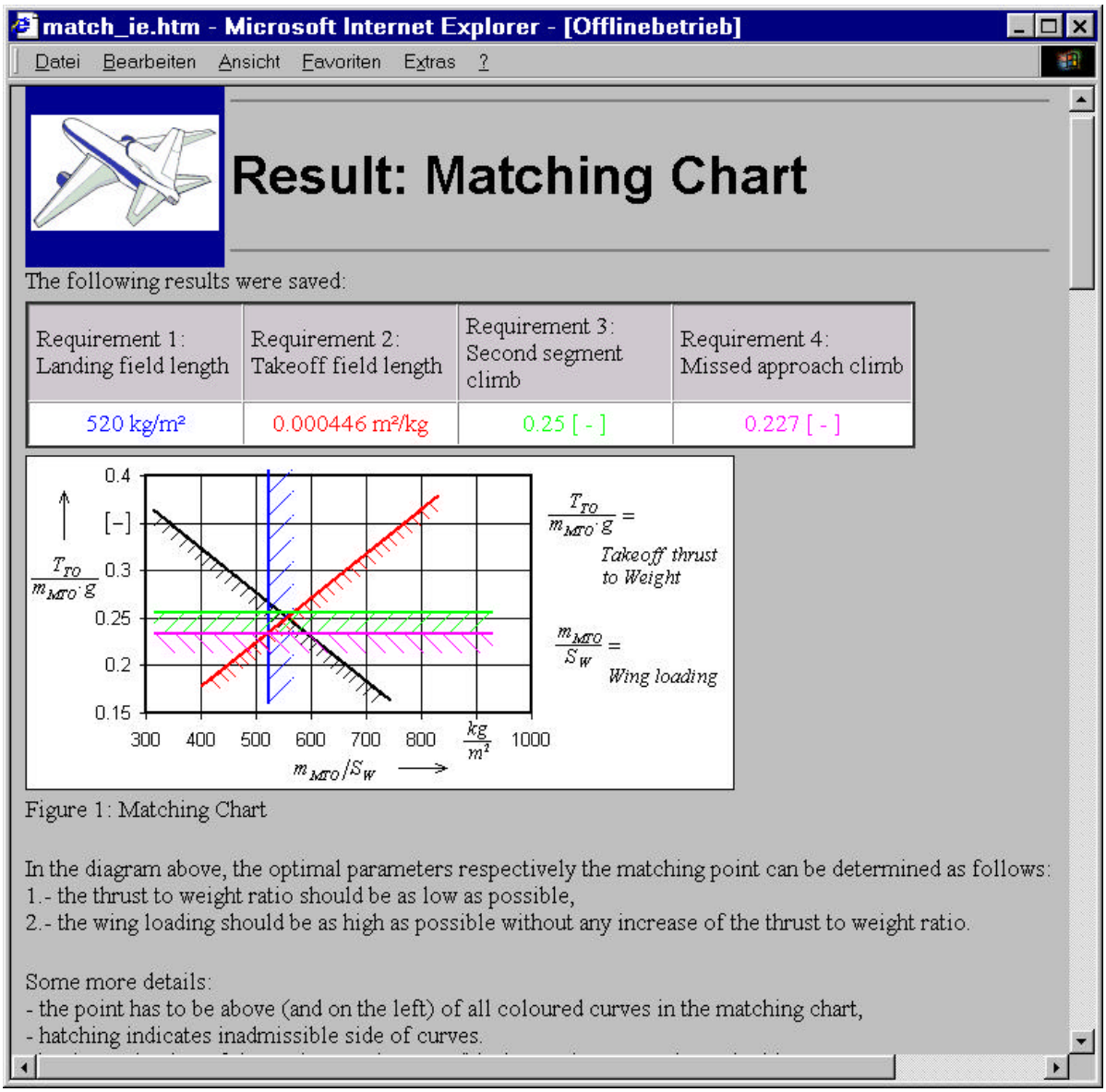
- Aircraft Design Education:,
  - PBL, small teams, one semester
  - industry project: whole & new aircraft
  - course notes in WWW (PDF)
  - students develop their own spreadsheets
  - WWW bulletin board, E-mail support, discussion group

- Experimental CBT development
  - Topic: Preliminary sizing (Loftin: NASA Ref. Pub. 1060)
  - HTML, JavaScript, Java
  - Multimedia: HTML with video

First Results

University of Applied Sciences, Hamburg

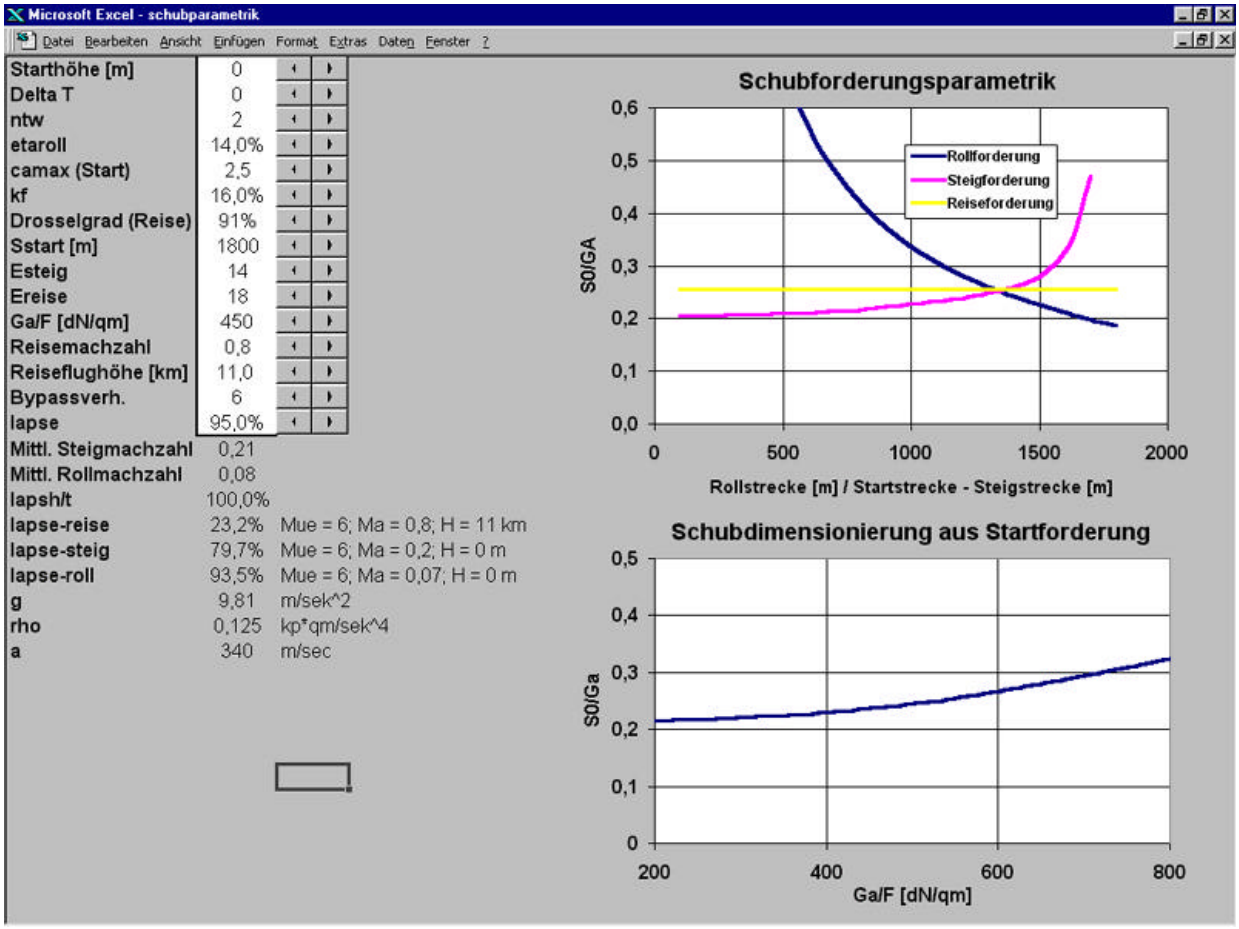
Screen shot from CBT/WBT module on preliminary sizing



First Results

Technical University of Berlin

Screen shot from Excel program on
sizing of the engines for take-off and cruise



Conclusions

CBT in aircraft design education:

- potential to improve teaching & learning situation
- danger: pitfalls (see experience from maintenance training)
- far too expensive

Recommendations

CBT designed in internationally combined effort

- course modules linked in open architecture on WWW
- http://www.AircraftDesign.org