

Knowledge Integration in the Aircraft Design Education

Balázs Gáti

7th European Workshop on Aircraft Design Education



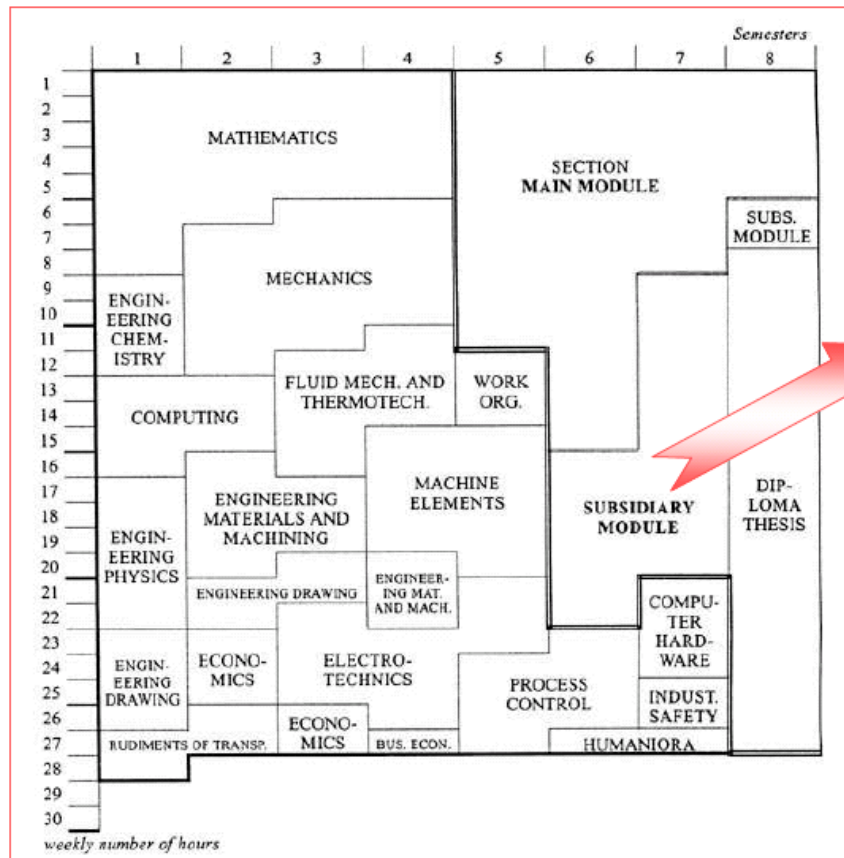
1. *Introduction*
2. *System of Semester Works*
3. *Aircraft Design Education*
4. *Conclusion*

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Education System in Hungary

BSc. engineering program in English at BUTE



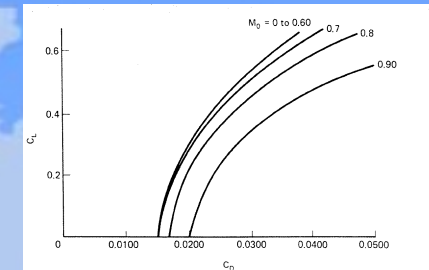
Subject			W. H. / Semester							
Name	Code	Credits	1	2	3	4	5	6	7	8
Subsidiary Module										
Mechanical Engineering - Aircraft										
Aerodynamics	BMETKKOB626	3						3		
Theory of Propulsion I	BMETKKOB627	3						3		
Theory of Propulsion II	BMETKKOB724	3							3	
Propulsion and Turbo-Machinery	BMETKKOB725	4							4	
Mechanics of Flight	BMETKKOB726	5							5	
Airframes	BMETKKOB837	5								5
Avionics	BMETKKOB838	2								2
Special Airplanes	BMETKKOB839	2								2
Operation of Aircraft	BMETKKOB840	5								5
Airworthiness	BMETKKOB841	3								3
Aircraft System Engineering	BMETKKOB842	3								3

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System of Semester Works

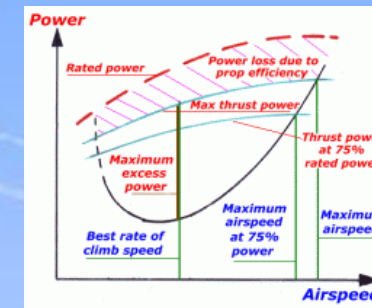
Aerodynamics:

„Calculate the polar of your favourite airplane type!”



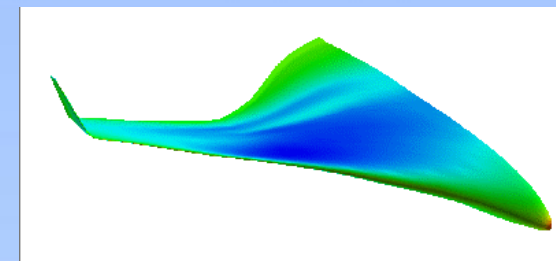
Flight Mechanics:

„Calculate the Penauld-diagram and climb performance of the chosen airplane!”



Aircraft Structure:

„Calculate the safety factor in the wingspar of the chosen airplane !”



System of Semester Works

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Students

- Emotional motivation
- Contact companies for lacking data
- Facing non-uniform problems
- Learn to simplify
- Learn to make own decisions
- Investigation of the same airplane from different point of view
- Feeling the consequents of non-reliable work

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System of Semester Works

Educational staff

- Written work-help (general)
- Face-to-face consultation
- Non-uniform solutions
- Evaluation is more subjective

Aircraft Design Education

First lecture

Provocative question:

**„Let we design an aircraft better than Cessna 172.
What should be the first step?”**



**The students have learned
Flight Mechanics, Aerodynamics, Aircraft Structures
but they can't use their knowledge**

Aircraft Design Education

Why?

Aircraft design: Performance → Geometry

Aircraft design \neq

- Setting up an equation system
- Solving the equation system

Aircraft design $=$

- Finding a proper path in the forest of aircraft parameters
- Following the path



Aircraft Design Education

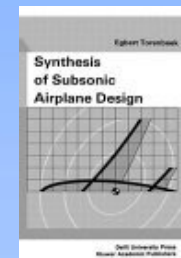
First Part: Following the path

Base-line: J. Roskam: Airplane Design

- Step-by-step method
- Simple, easy to understand

Other examples from:

- E. Torenbeek: Synthesys of Subsonic Airplane Design
- D. Stinton: The Design of the Aeroplane



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First Part: Following the path

- **Mission specification (marketing)**
- **Preliminary sizing (statistical methods)**
- **Layout sketches (design aspects)**
- **Preliminary calculation (proper precision)**
- **Iteration (role of experience)**

Knowledge integration !!!

Aircraft Design Education

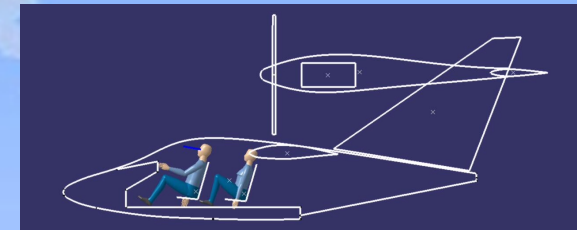
Semester Work

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1. Task: Calculate the CG positions

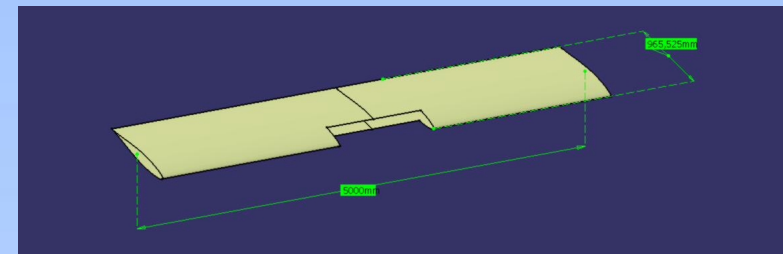
2. Task: Find a proper arrangement

- CG margins
- Field of view
- Cockpit dimension
- Propeller plane versus passenger
- Wingspar versus cockpit
- Shape characteristics (special engine pod!)



3. Task: Define the dimension of the horizontal tailplane

- Stabilizer (chord, span)
- Elevator (relative chord)



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Semester Work

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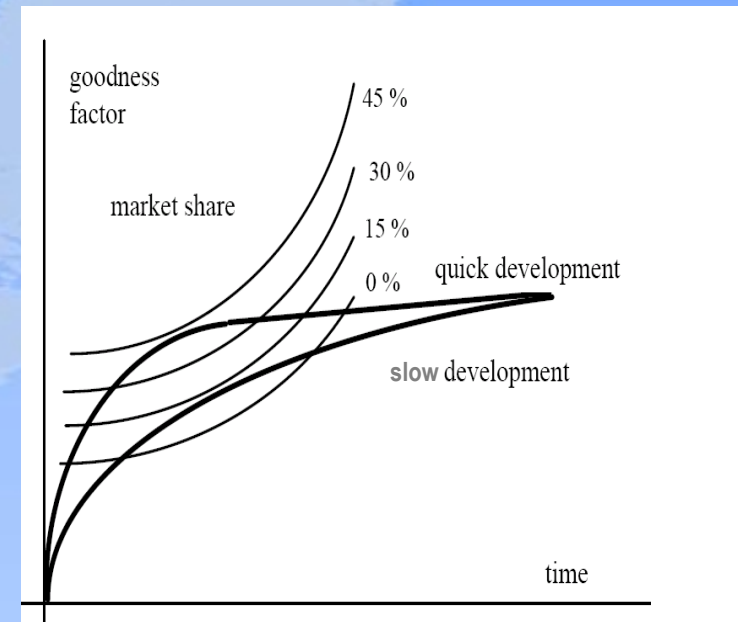
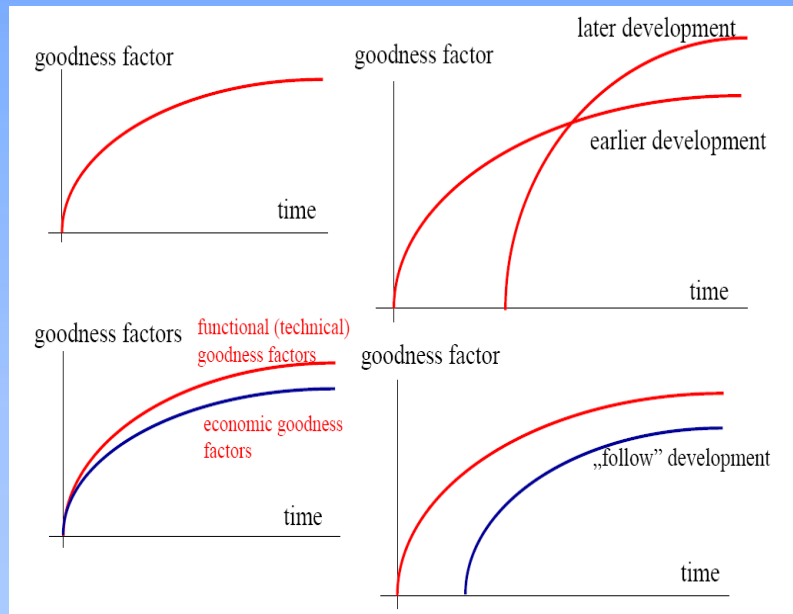


1. Rating of the results by invited testpilot
2. Students make a try, too
3. Feedback-meeting: find the link between the decisions and the test results

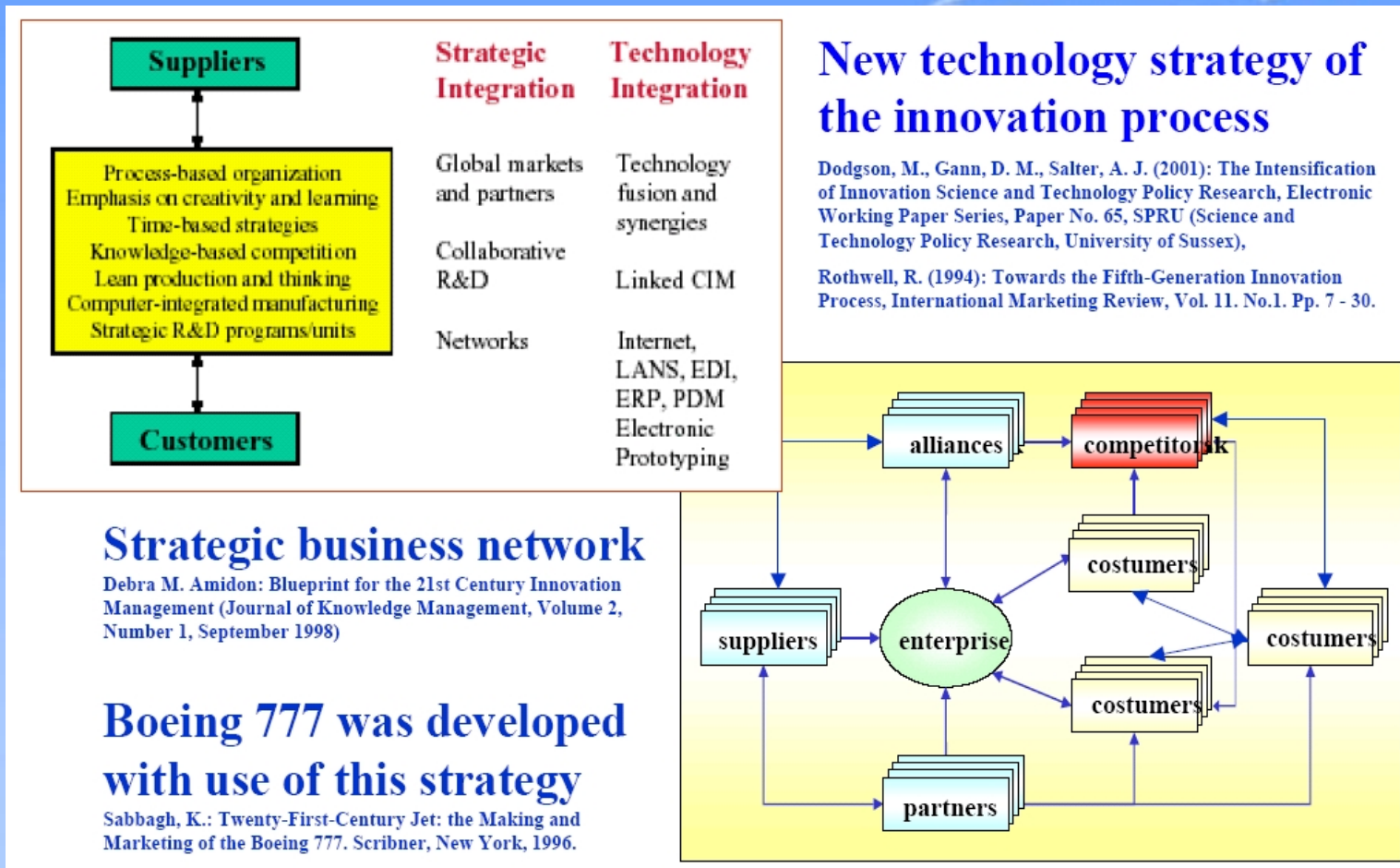
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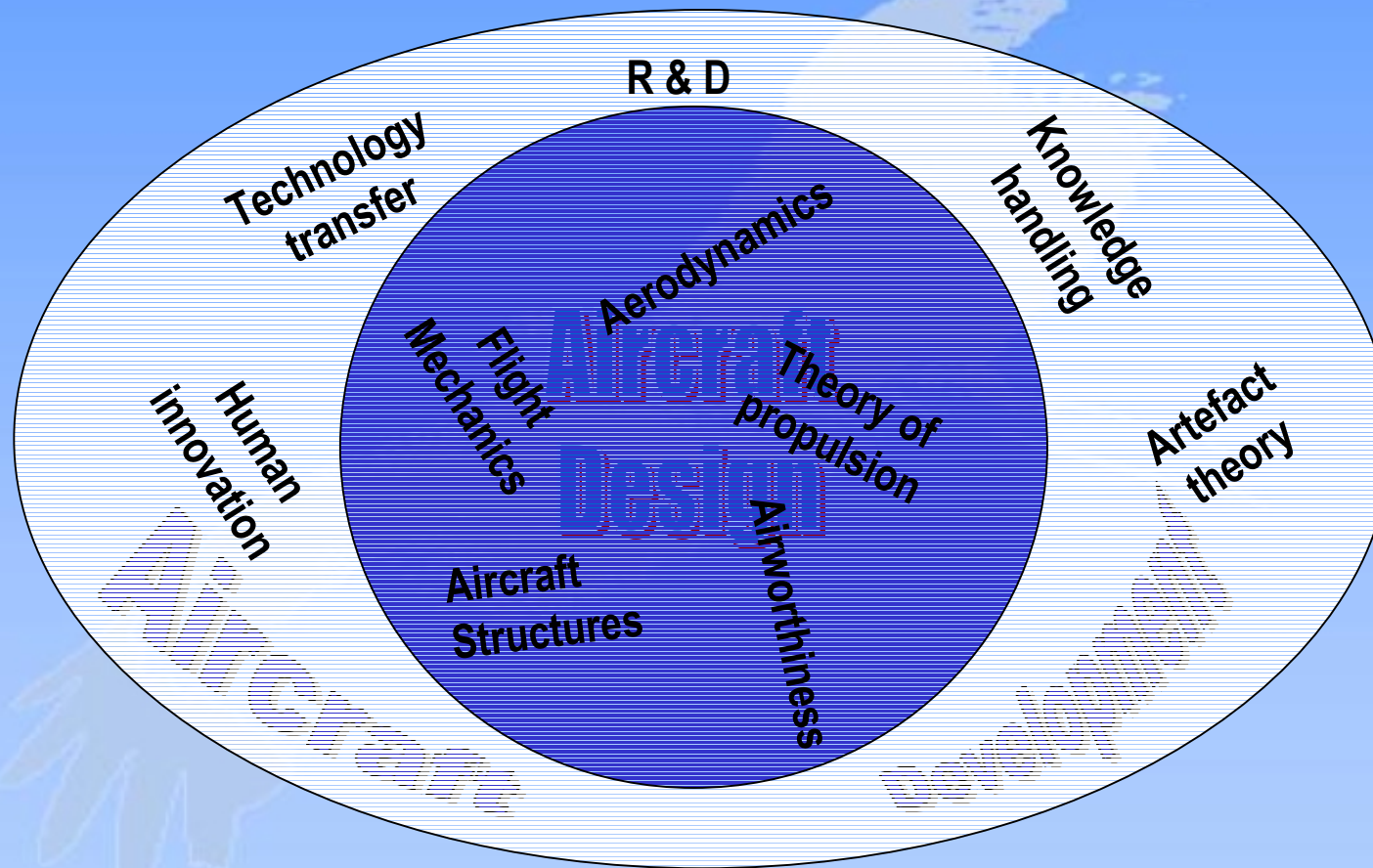
Second Part: Design Philosophies



Aircraft Design Education



Knowledge Integration



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