



Brno University of Technology

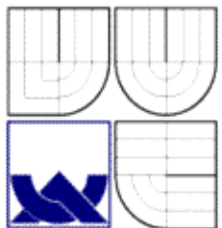


Research and Development Projects as Education Support

Jaroslav Juracka, Assoc. Prof., Eng., Ph.D.

juracka@fme.vutbr.cz

<http://lu.fme.vutbr.cz>





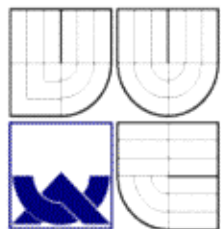
Motivation:

Do we need projects for education?

- ❖ knowledge
- ❖ financial sources

Contents

- BUT and IAE review
- Education plan
- Projects presentation
- Project contributions





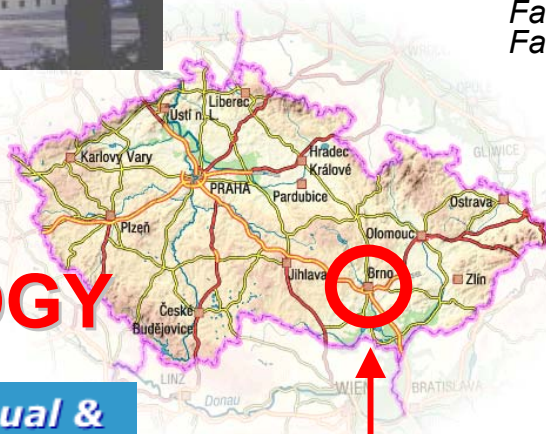
Established 1899 as a second oldest and biggest technical university in the Czech Rep.

16.000 students
2.473 employees (1.015 academics)

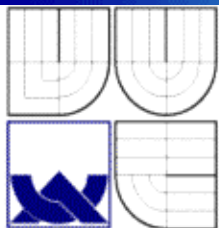
8 faculties

Faculty of Civil Engineering
Faculty of Mechanical Engineering
Faculty of Electronics and Communication
Faculty of Information Technology
Faculty of Business and Management
Faculty of Architecture
Faculty of Chemistry
Faculty of Fine Arts

BRNO UNIVERSITY OF TECHNOLOGY



Education, Audiovisual &
Culture Executive Agency



Diploma Supplement Label



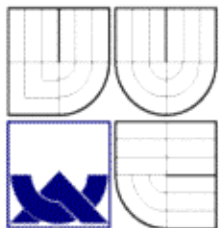
INSTITUTE OF AEROSPACE ENGINEERING

Educational activities

- Bachelor graduate studies (Bc.)
 - Airline transport pilot school (CAA Czech Republic approval)
- Master graduate studies (Ing.)
 - Aircraft design
 - Aeronautical Transport
- Post graduate studies (Ph.D.)

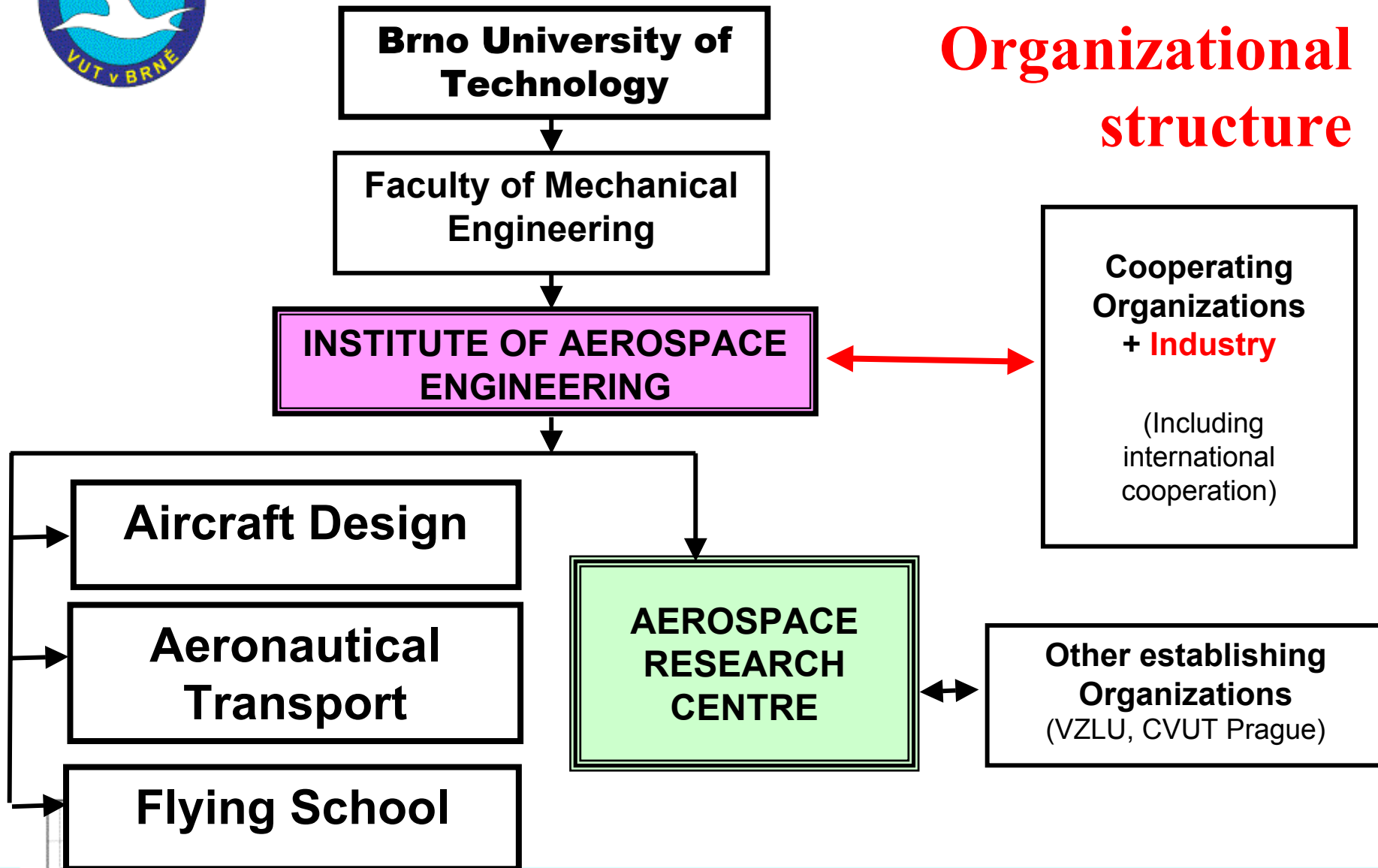
Scientific and research activities

- Aerodynamic analyses
- Stress analyses
- Design and computer modeling of aircraft and aircraft structures
- Static and dynamic testing of aircraft structures (CAA Czech Republic approval)





Organizational structure



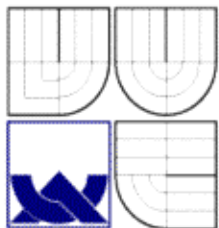
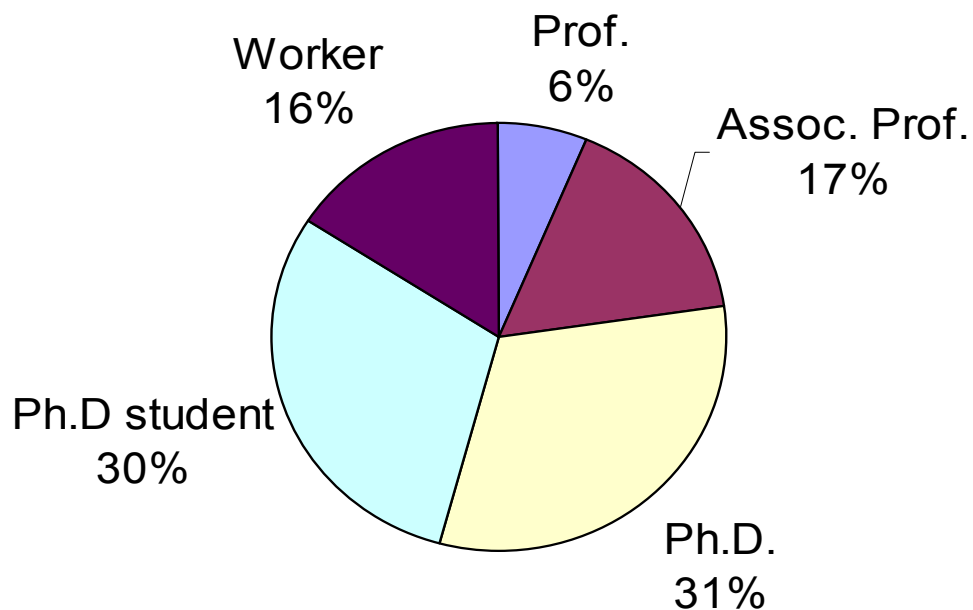


Personal capacity

employees 35

total work load 32

Position	Quantity	Work Load	Avarage
Prof.	3	2	0.6667
Assoc. Prof.	6	5.25	0.875
Ph.D.	10	10	1
Ph.D student	11	9.55	0.868
Worker	5	5	1
Total	35	31.8	0.909

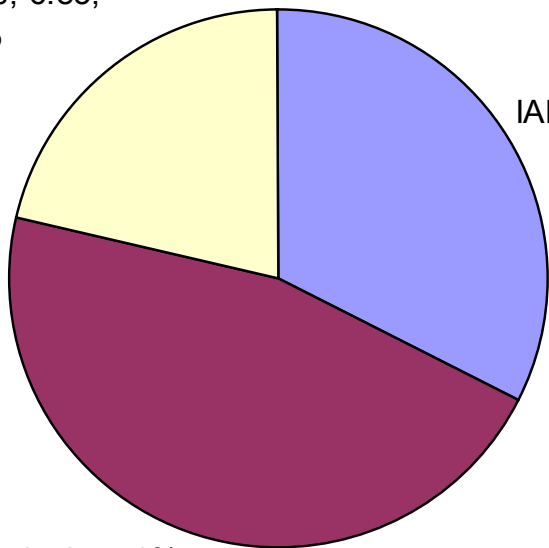




Personal capacity versus Sources

Personal capability

EU projects; 6.85;
21%



ARC; 14.85; 46%

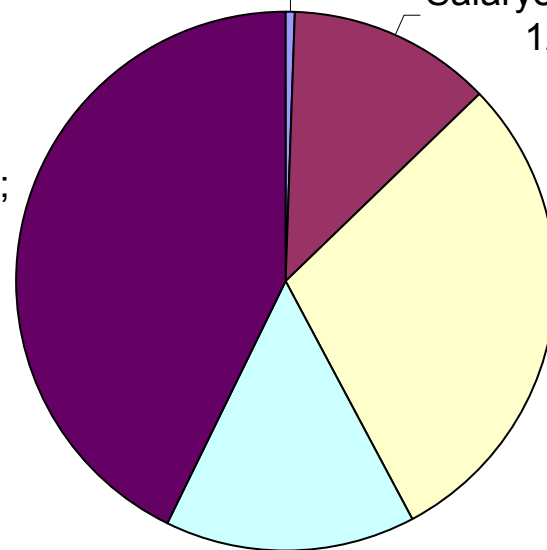
IAE ; 10.5; 33%

ARC projects;
494.3; 42%

Sources

Service; 6.5; 1%

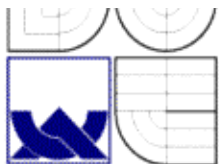
Salaries; 139.5;
12%



EU projects;
341.4; 30%

MI projects;
171.3; 15%

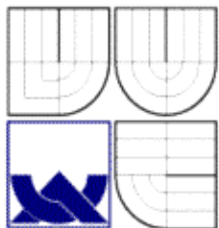
Do we need projects for education?





Master graduate studies (Ing.)

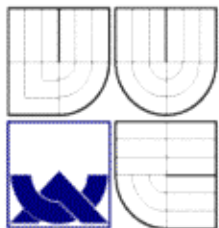
Aircraft design	1. year		2. year	
	winter semester	summer semester	winter semester	summer semester
Aerodynamics I				
Aerodynamics II				
Flight Mechanics I				
Flight Mechanics II				
Aircraft Design I				
Aircraft Design II				
Aircraft Design III				
Computer Aided Design and Manufacturing				
Aircraft Structure I				
Aircraft Structure II				
Aircraft Composite Structures				
Fatigue of Aircraft Structures				
Aeroelasticity				
Aircraft Materials				
Aircraft Manufacture I				
Aircraft Manufacture II				
Aircraft On-Board Systems I				
Aircraft On-Board Systems II				





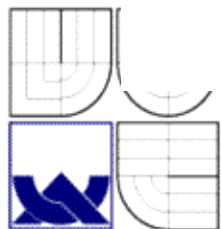
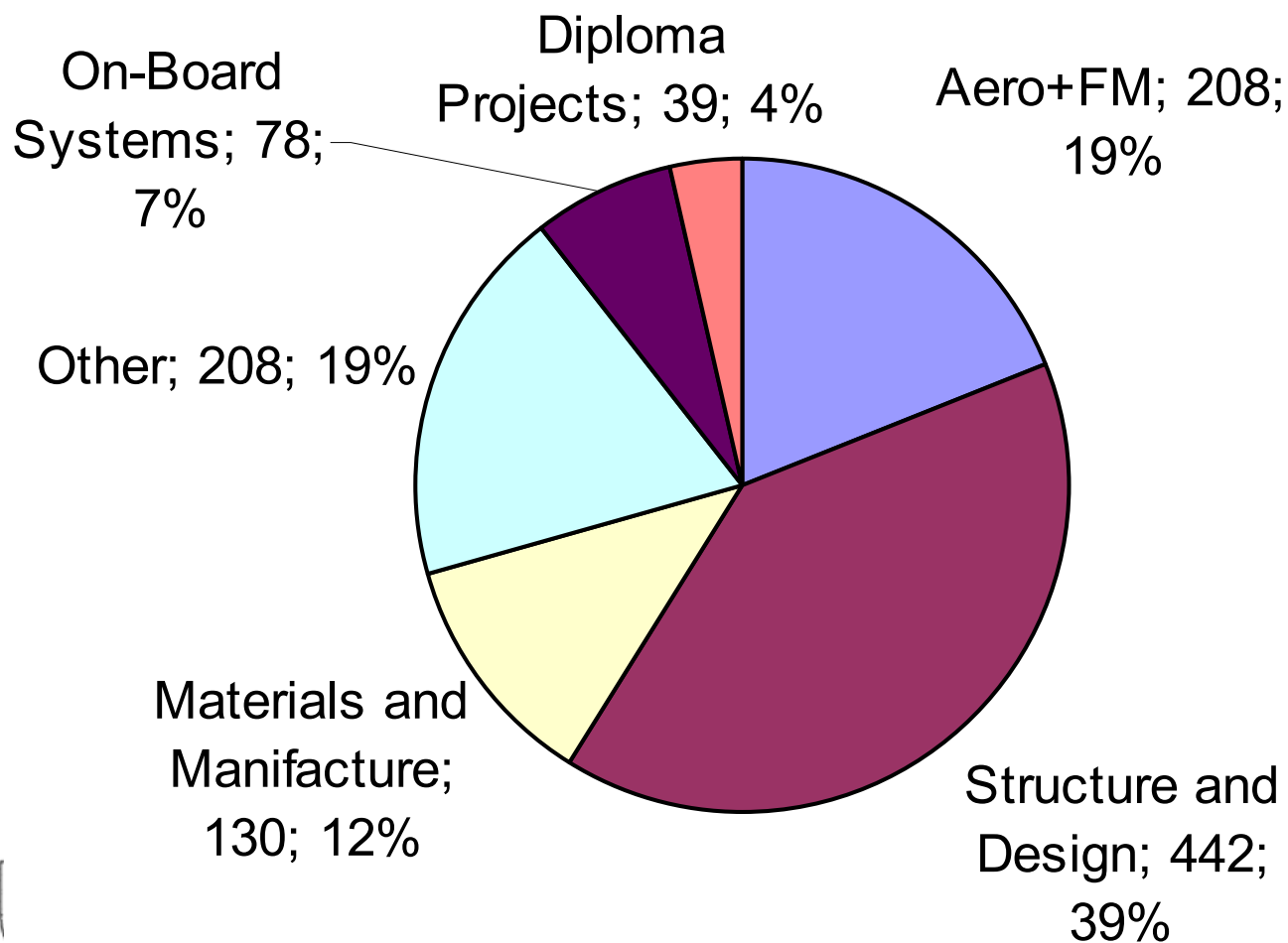
Master graduate studies (Ing.)

Aircraft design		1. year		2.
		winter semester	summer semester	winter semester
Aircraft Propulsion	Aircraft Propulsion			
Aviation Law and Regulations	Aviation Law and Regulations			
Reliability and Maintainability of Aircraft	Reliability and Maintainability of Aircraft			
In-Flight Experiments	In-Flight Experiments			
Semester Project	Semester Project			
<i>faculative lectures</i>				
Principles of Space Flight	Principles of Space Flight			
English in Aviation	English in Aviation			
English in Aviation	English in Aviation			
Aeroplane Propellers	Aeroplane Propellers			
Helicopters	Helicopters			
Aeroacoustics	Aeroacoustics			
Aircraft Testing	Aircraft Testing			
Diploma Seminar (M2325)	Diploma Seminar (M2325)			
Diploma Project (M2325)	Diploma Project (M2325)			



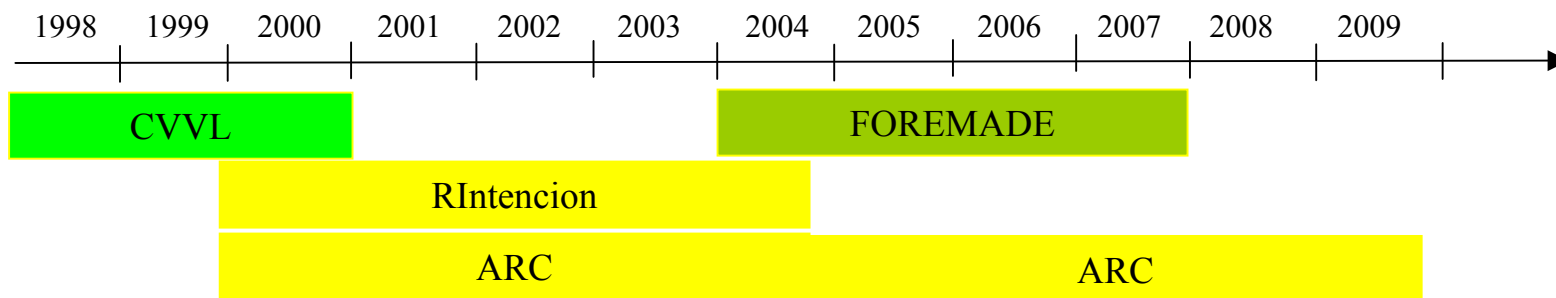


Subject groups rate





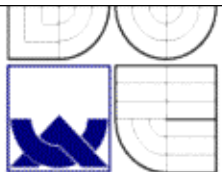
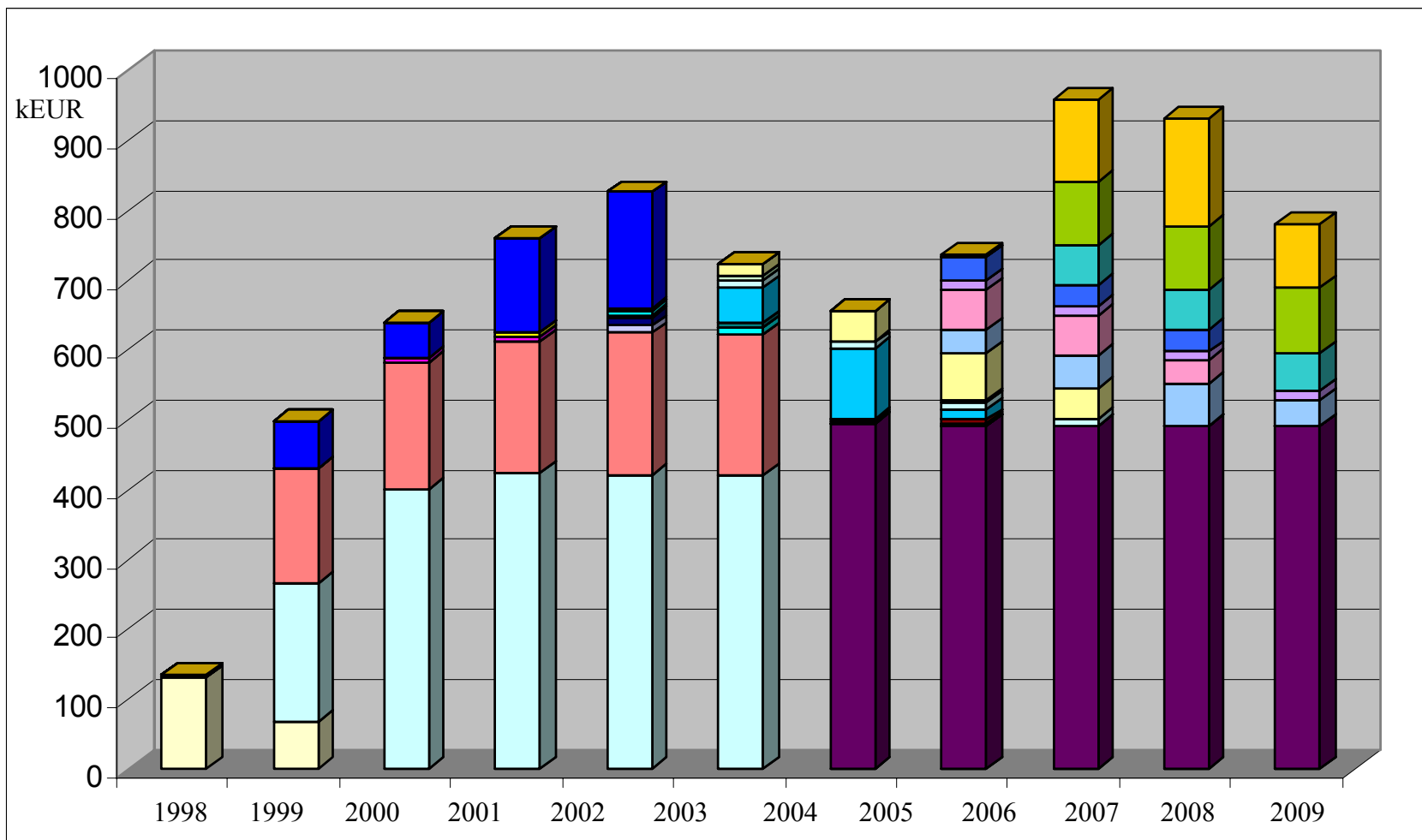
History of the projects



EV 55



Project budgets



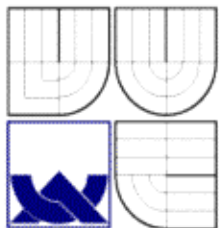


Are projects necessary for education?

Yes!

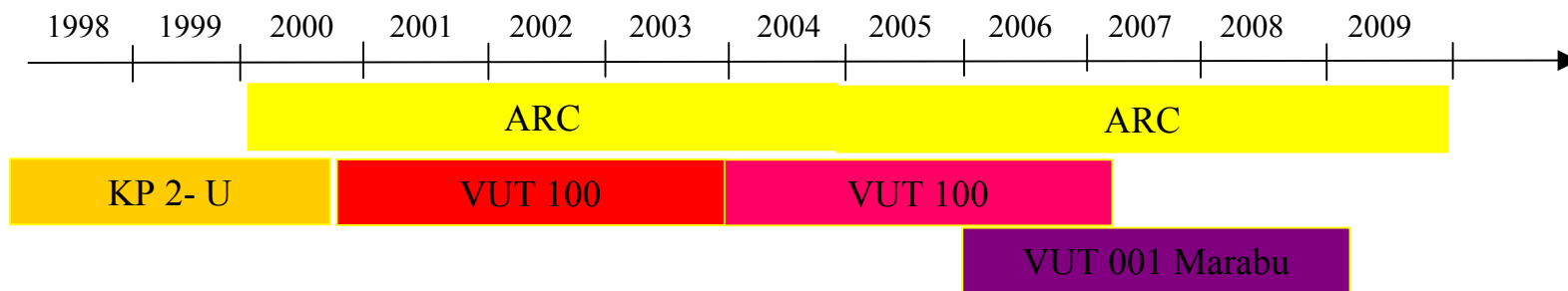
- We have got a financial sources for teachers.
- We have a opportunity for self learning. We can a new trends, knowledge, technologies transferred into education and passed to students.

Examples?



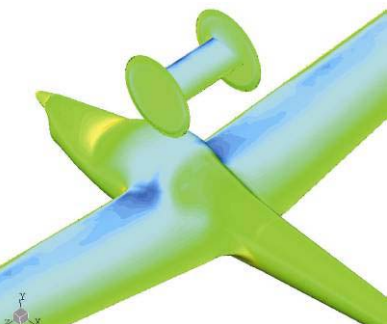
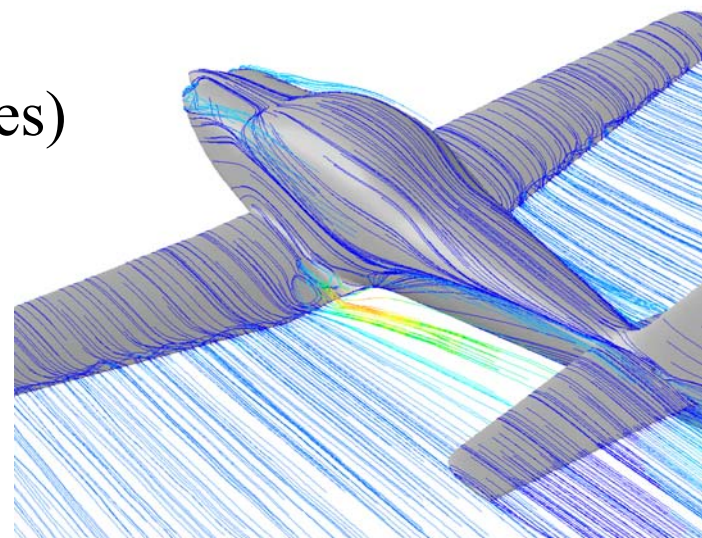


Aerodynamics and Flight Mechanics



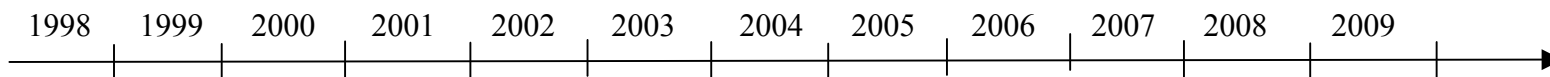
CFD (Fluent, CFX) => 3D aerodynamics progress

- stalling behavior
- flowfield solution of aircraft body(nacelles)
- calculation with propeller stream influence

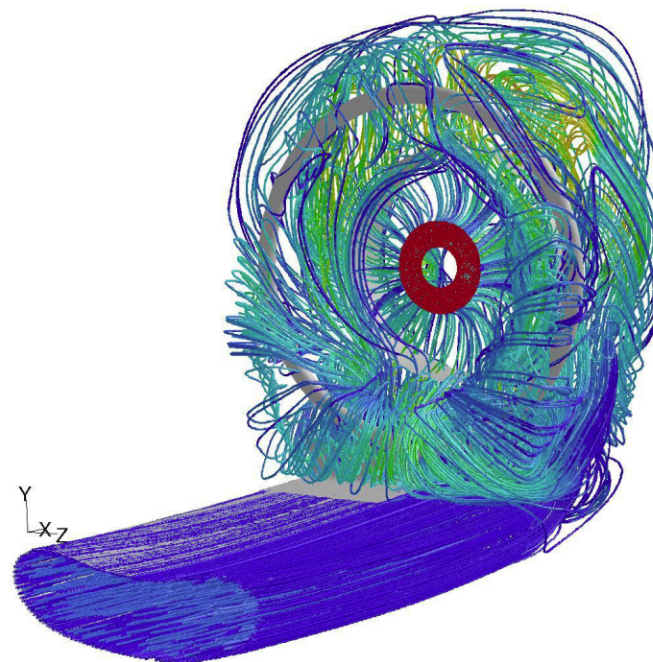
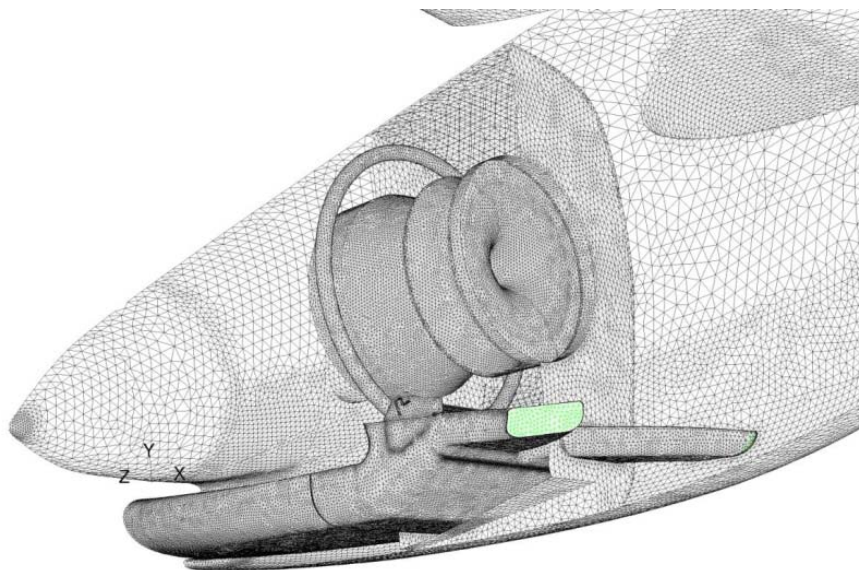




Aerodynamics and Flight Mechanics

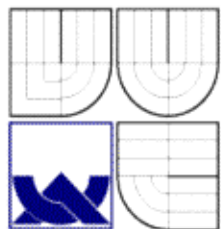


FOREMADE



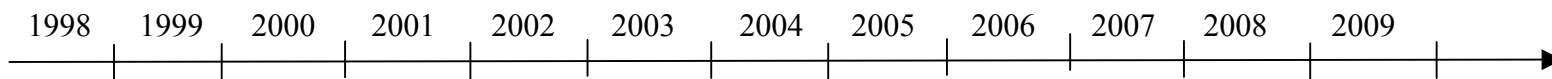
Foremade

Analysis of internal flow in turboprop engine intake



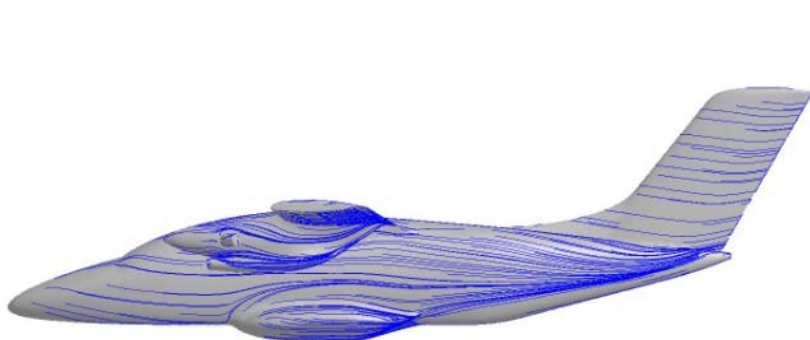


Aerodynamics and Flight Mechanics

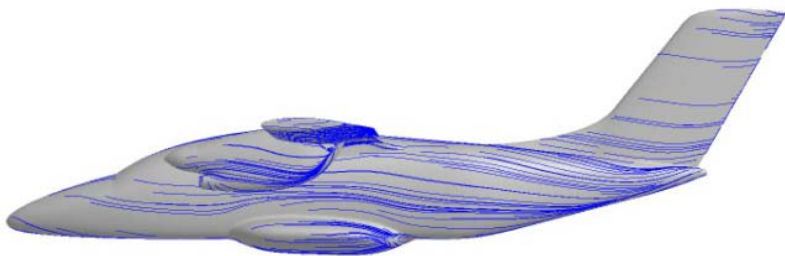


EV 55

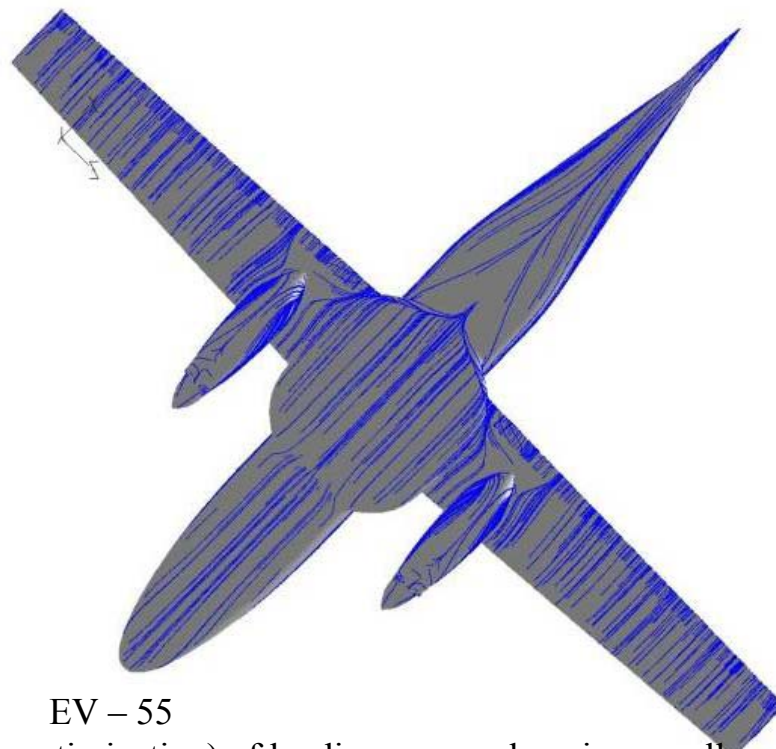
EV 55



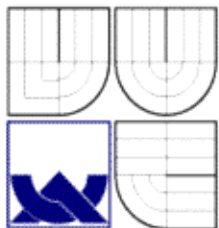
Y



Y



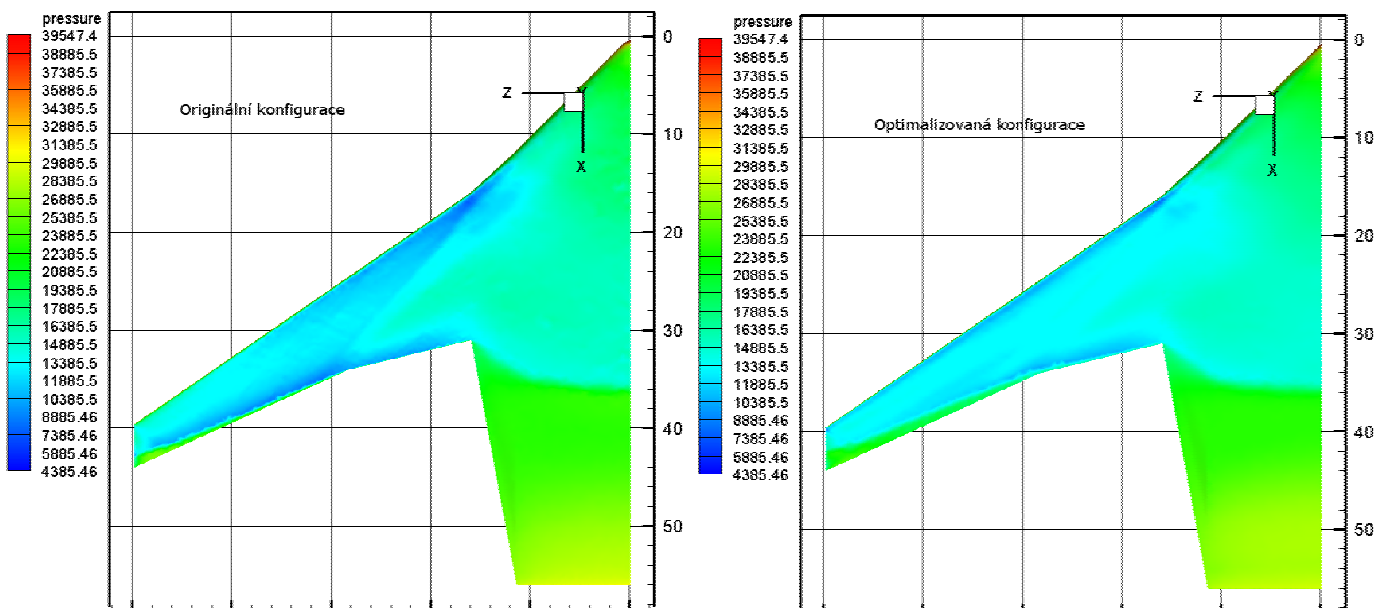
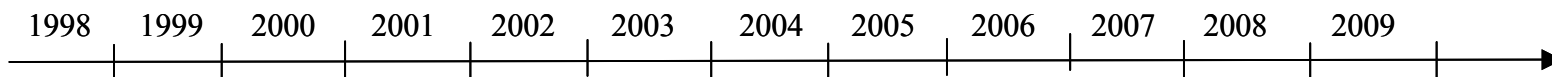
EV – 55



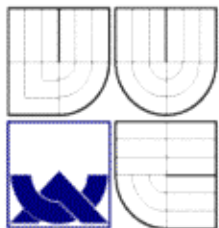
Detailed aerodynamic design (shape optimization) of landing gear and engine nacelles



Aerodynamics and Flight Mechanics



VELA – “Very Efficient Large Aircraft” 5FP project

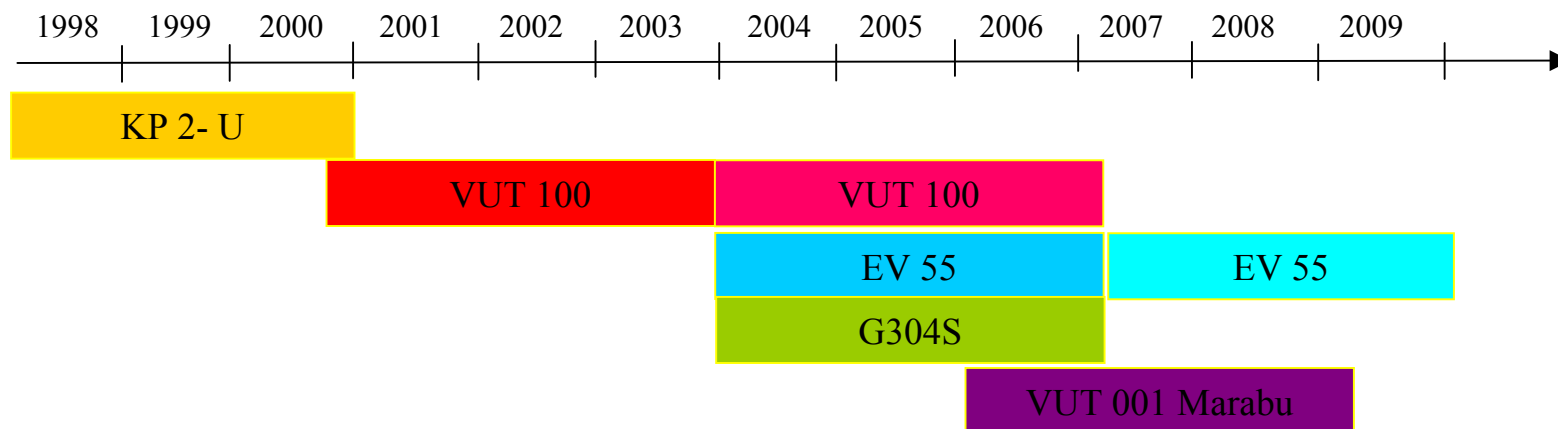


Aerodynamic optimization of flying wing configuration for transsonic speeds



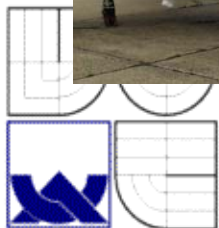
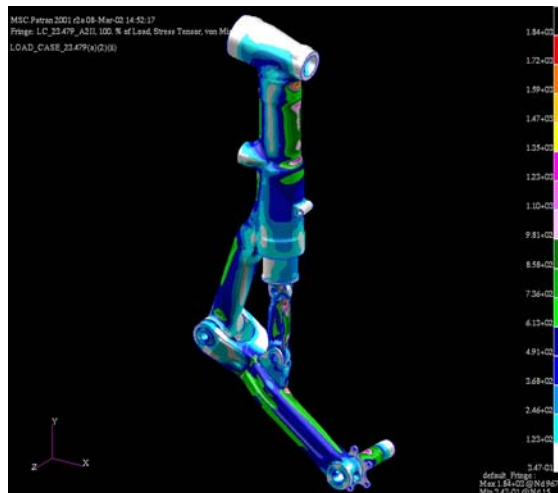


Aircraft Design and Structure



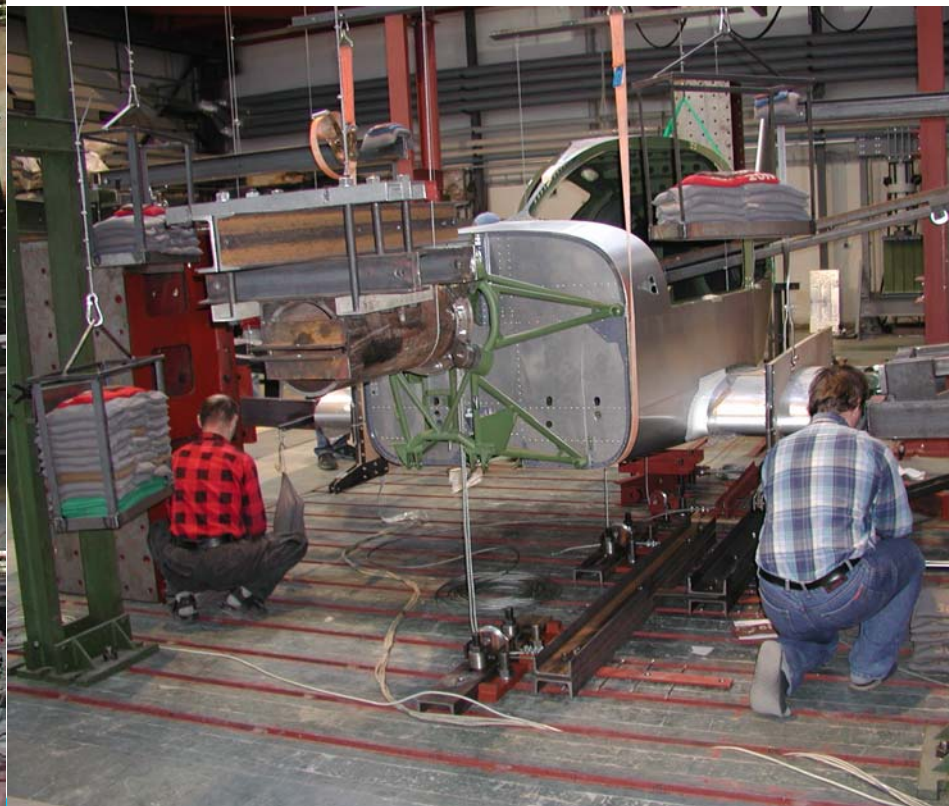
FEM (MSC.Nastran, Dytran, Fatigue....) => nonlinearity

- landing gears
- aircraft aeroelasticity



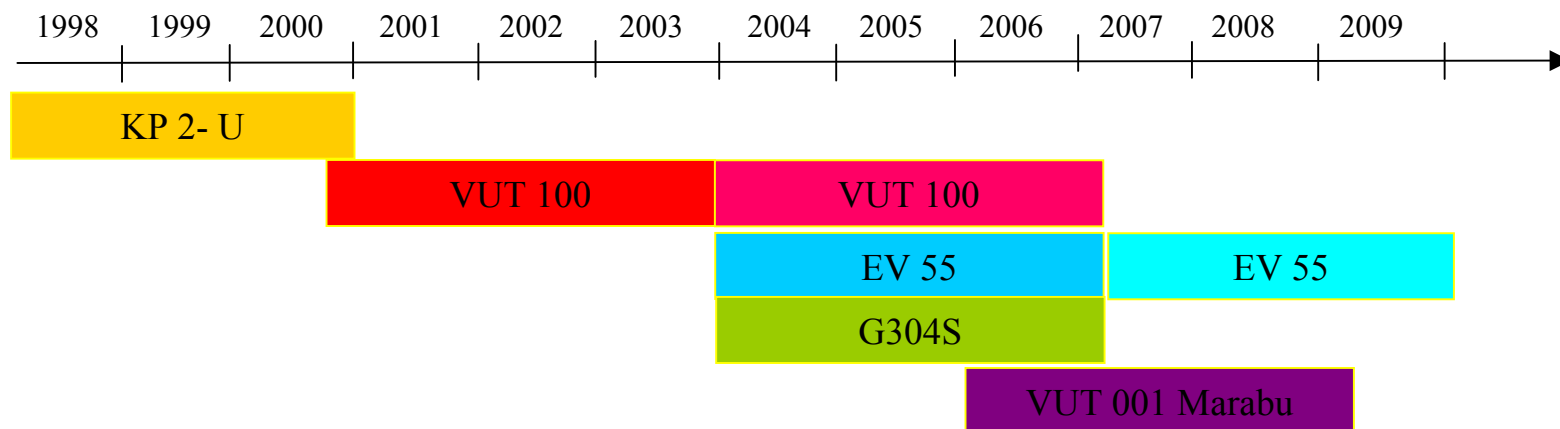
J.A.Komensky:

„Its better only to view one than listen several tomes about it.“



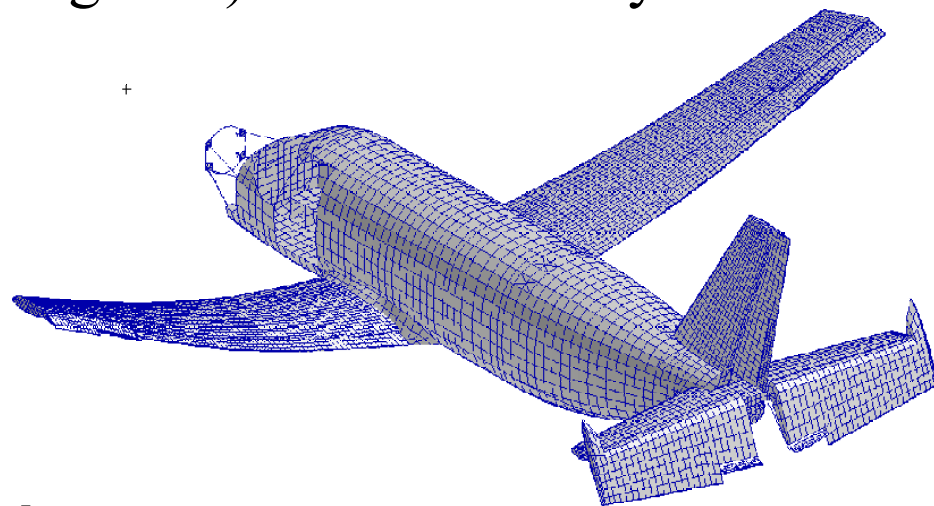


Aircraft Design and Structure



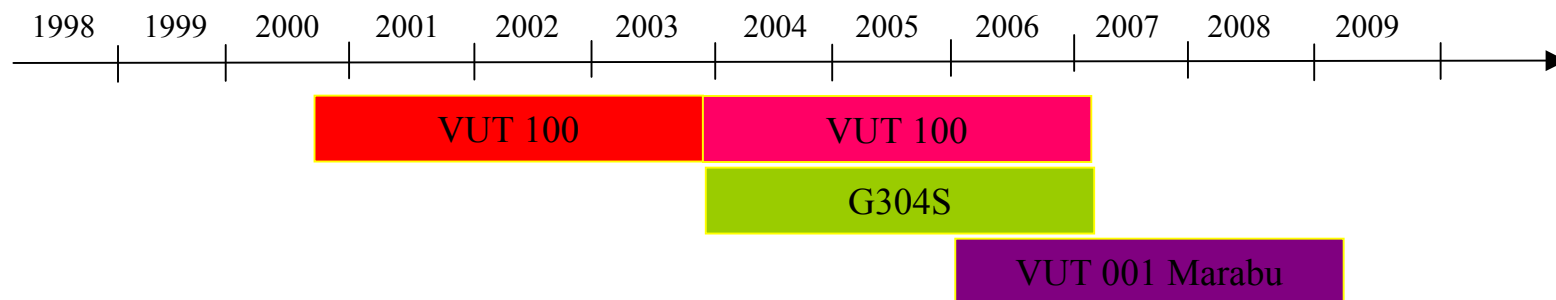
FEM (MSC.Nastran, Dytran, Fatigue....) => nonlinearity

- landing gears
- aircraft aeroelasticity

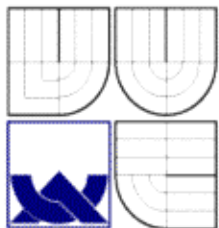
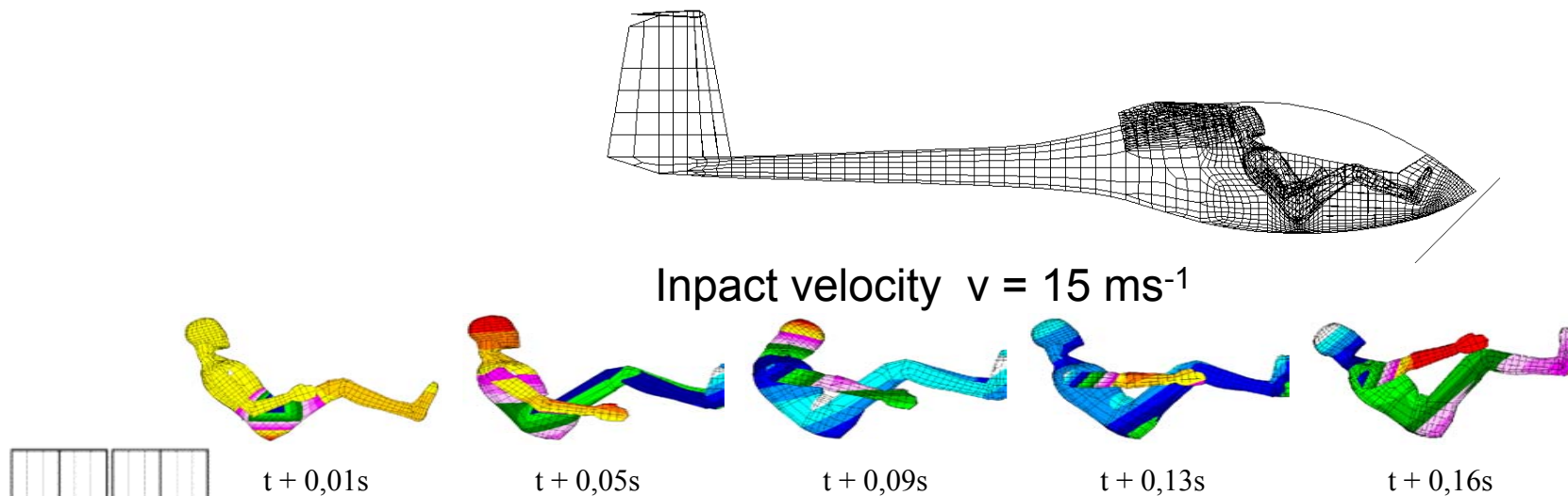




Aircraft Design and Structure



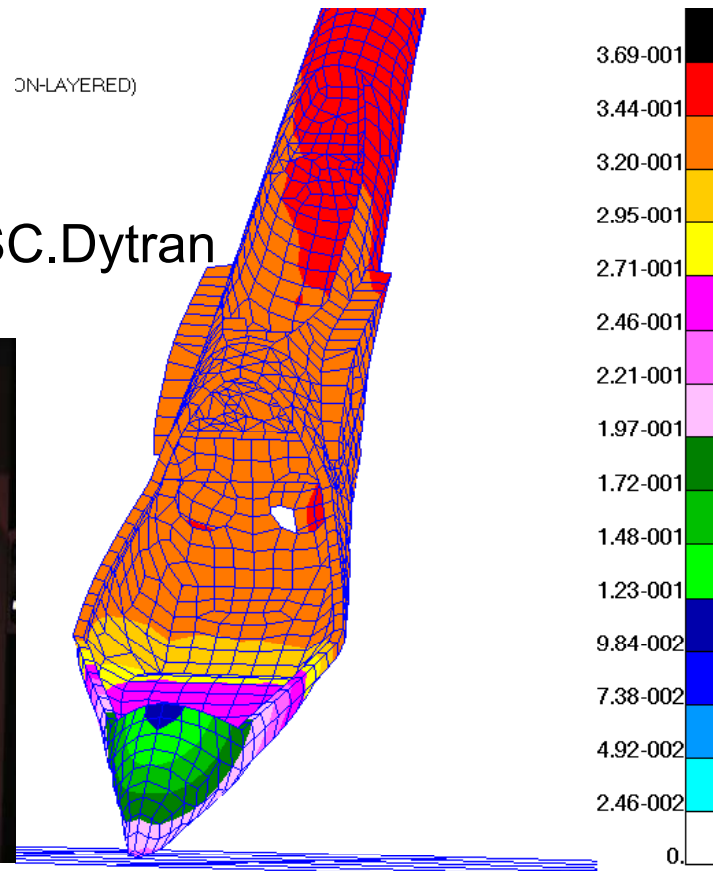
FEM (MSC.Nastran, Dytran, Fatigue....) => crash analysis



Glider Fuselage



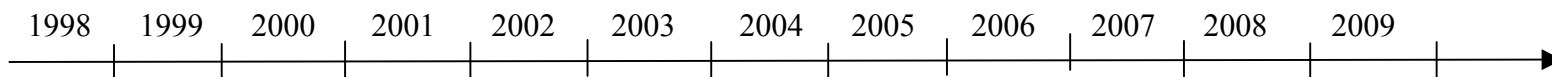
Simulation by MSC.Dytran



The ground impact - static test at IAE laboratory



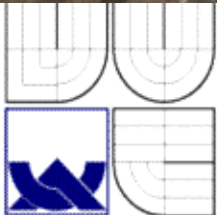
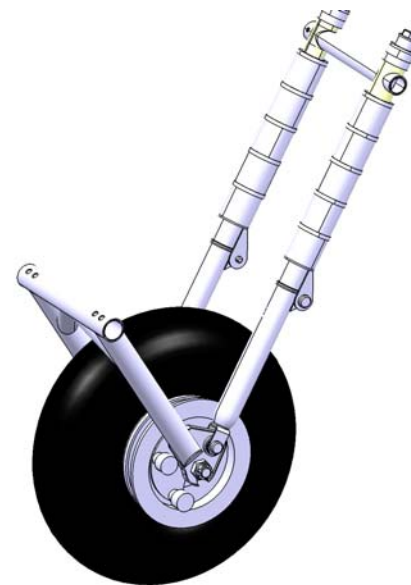
Aircraft Design and Structure



G304S

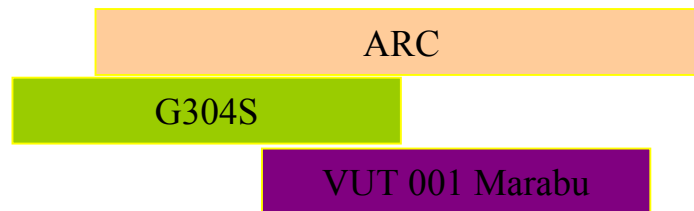
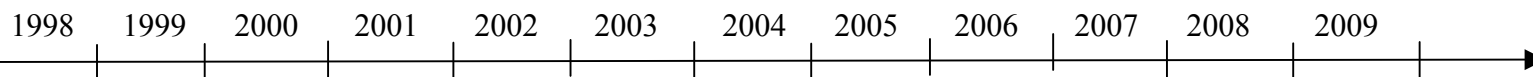
VUT 001 Marabu

Glider landing gear development



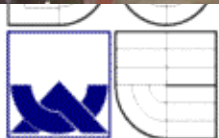


Aircraft Design and Structure



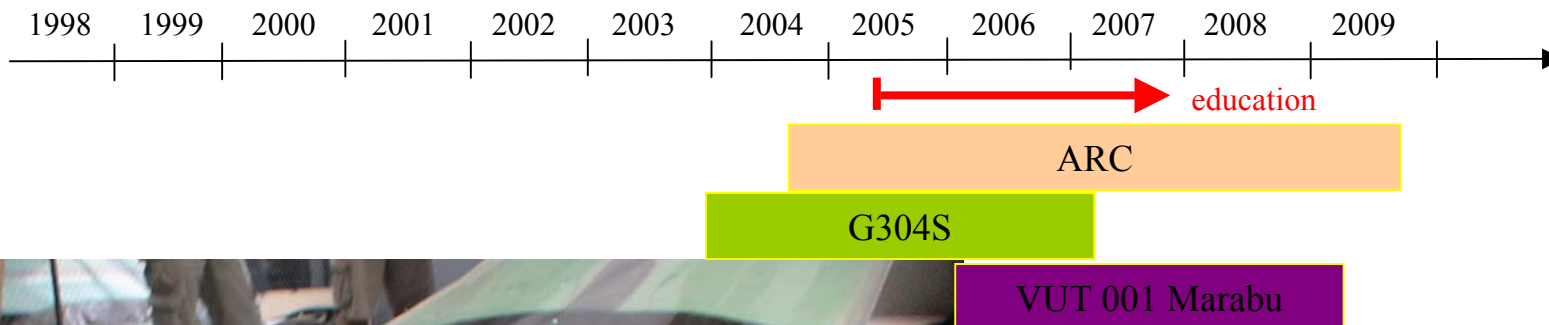
Composites structures

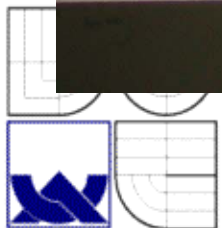
- new wing production technology
- buckling tests
- new test methodology (test with temperature influence)





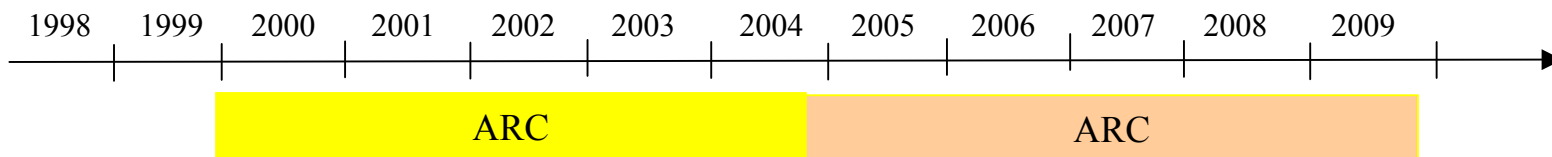
Aircraft Design and Structure





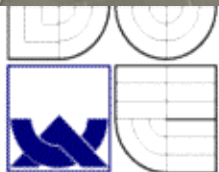
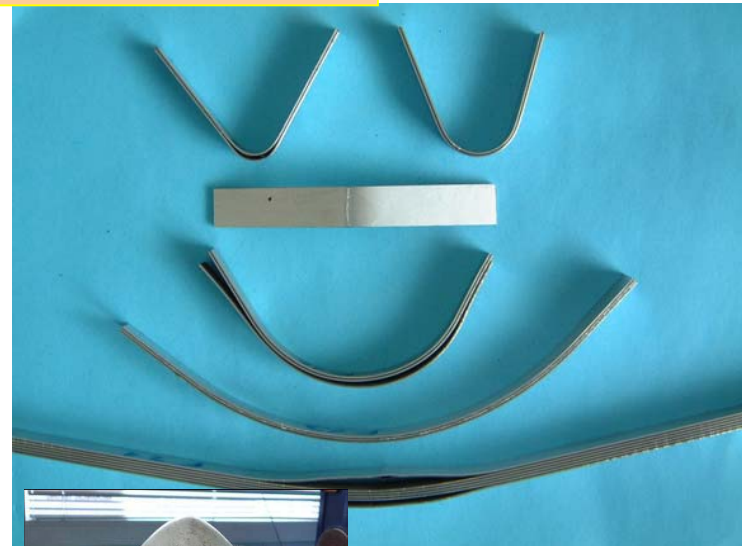


Materials and Manufacture



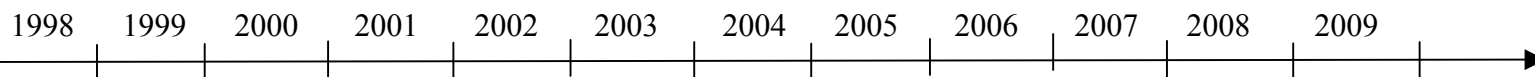
New materials and processes

- CARE materials and forming
- RFI technology (propeller cone)





Aircraft Systems

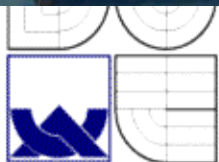
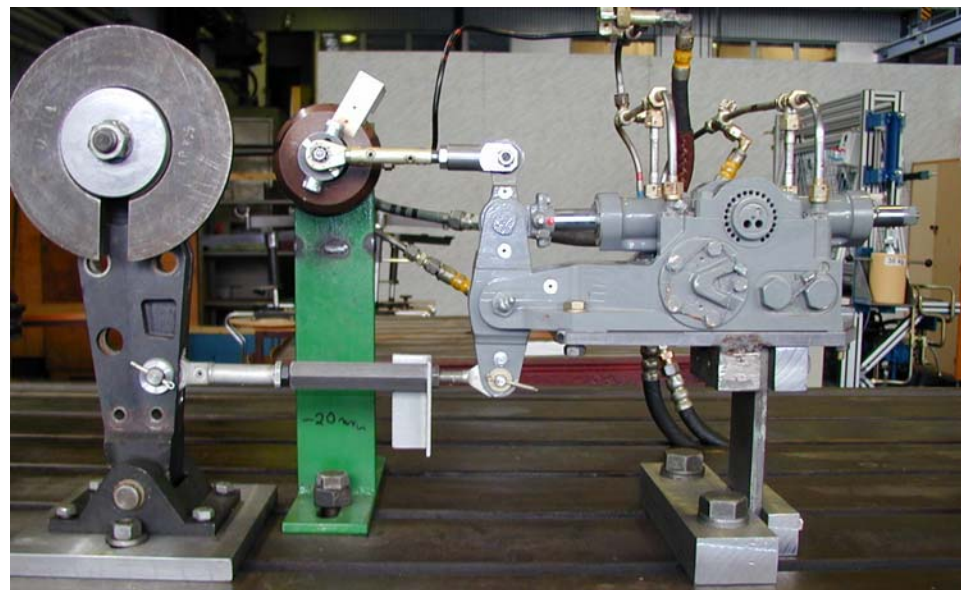


•hydraulic stand

EV 55

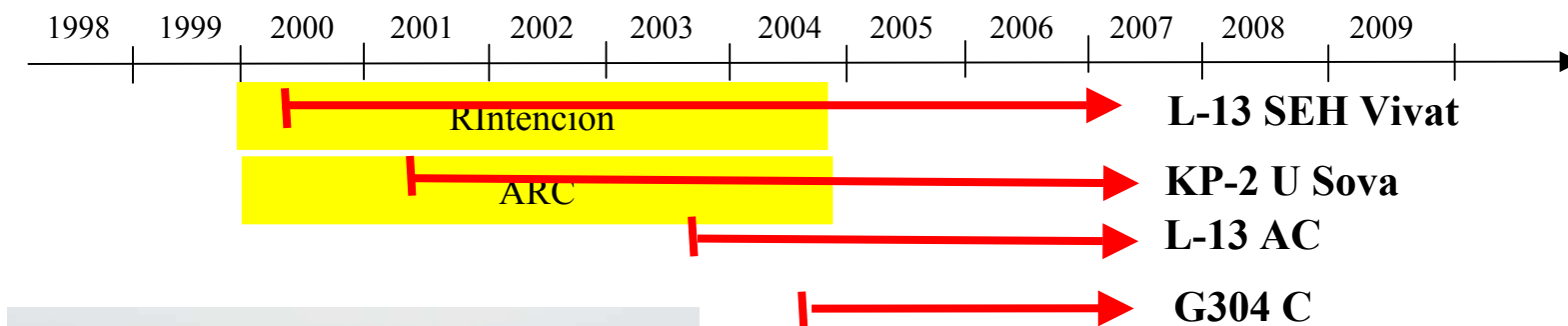
EV 55

HYDRAULIKA





In - Flight experiments





Thank You for your attention!

