

# The VUT100/200 GA Aircraft Family – Project & Realization

**Prof. Ing. Antonín Píštěk, CS.c.**

Director

**Institute of Aerospace Engineering**  
Faculty of Mechanical Engineering  
Brno University of Technology

**Ing. Robert Popela, Ph.D.**

Research assistant

**Institute of Aerospace Engineering**  
Faculty of Mechanical Engineering  
Brno University of Technology



EWAD 2005

Toulouse 19-20<sup>th</sup> October



## ***PRESENTATION OVERVIEW***

- the conception of a unified series of GA aircraft family VUT 100/200
- the experience with the co-operation with aircraft industry within the project
- educational impact on professional skills level of students

## ***THE VUT100 PROJECT MOTIVATION***

New requirements on pilot training according to the JAR-FCL regulations require new conception of aircraft for pilot training, especially for the early training up to the level of business pilot.



## **PROJECT HISTORY**

### **Z 90**

The new project at the beginning of the nineties. Foregoer of VUT 100. Chief Designer of this type was Prof. Pistek at present time director of Institute of Aerospace Engineering TU in Brno. The mock-up was presented at the Paris Air Show in 1991.

### **KP-2U OWL**

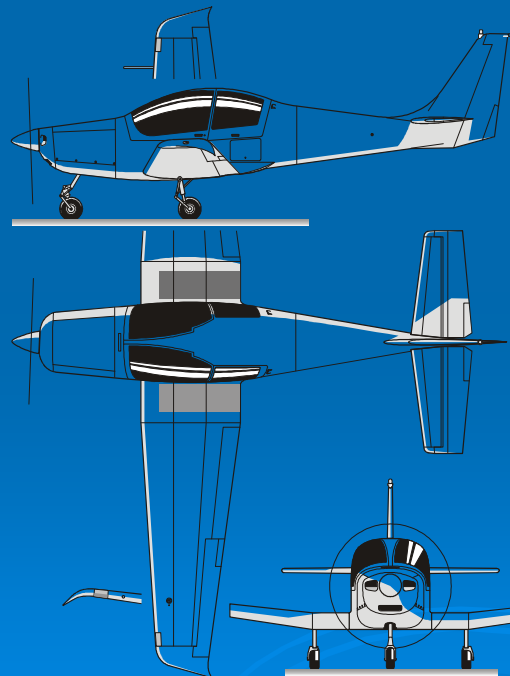
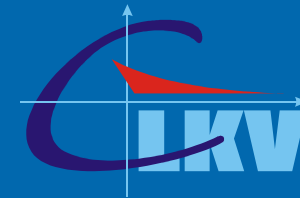
Project of Institute of Aerospace Engineering  
Co-operation with KAPPA 77 Inc. company.  
Verification of aerodynamic conception and structural solution of VUT 100 models. About 150 pieces of KP-2U were produced.





## VUT 100 PROJECT

- The new project of Institute of Aerospace Engineering BUT in Brno.
- Chief Designer Prof. Pistek, director of IAE.
- Supported by grant of Ministry of Industry and Trade, Czech Republic.
- The large co-operation with Czech aircraft industry.
- Project is included in research program of IAE's „Aerospace Research Centre”.



### GENERAL DIMENSIONS

Length	8.03 m
Height	2.90 m
Wing Span	10.20 m
Wing Area	13.11 m <sup>2</sup>

### WEIGHTS

Max. Take-Off Weight	2780 lb
Empty Weight	1520 lb
Fuel Capacity	340 l
Useful Load	1260 lb
Load Factors	+4.4/-1.76

### INTERNAL DIMENSIONS

Cabin Length	2.50 m
Cabin Width	1.17 m
Cabin Height	1.22 m
Baggage Compartment Volume	0.45 m <sup>3</sup>

Seats	4/5
-------	-----

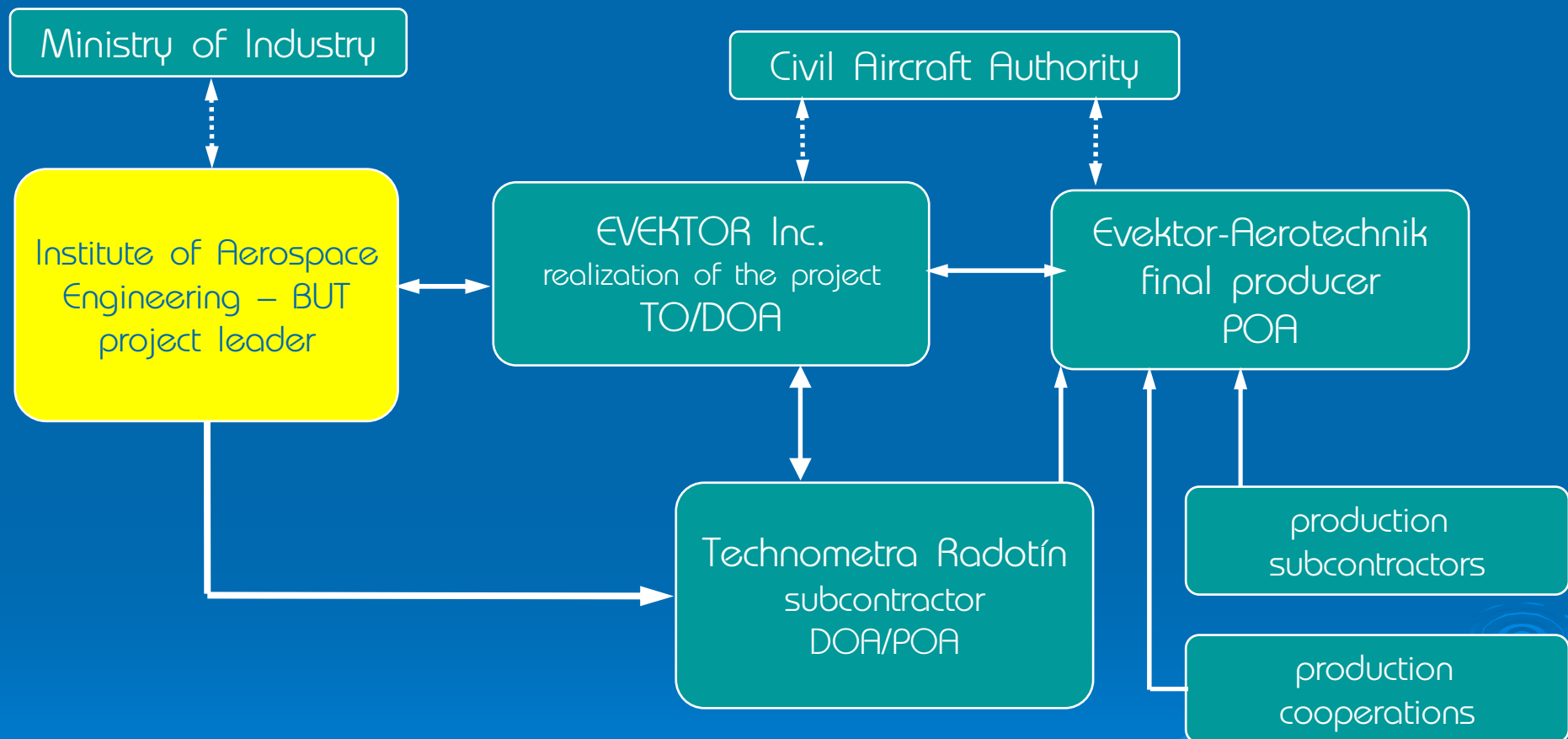
### PERFORMANCE

Max. Level Speed	168 kts
Max. Cruise Speed	150 kts
Cruise Speed (75%)	140 kts
Max. Climb Rate	1300 ft/min
Stall Speed	50 kts
Range (with 45' reserve)	1080 NM
Endurance	8 hrs





## ORGANIZATIONAL STRUCTURE OF VUT100 PROJECT



## TECHNICAL DESCRIPTION

- new generation of four-to-five seater,
- JAR-23/ FAR-23 regulation,
- light, multi-purpose, single engine,
- all metal, low wing aircraft with 2+3 seating arrangement
- retractable tricycle landing gear.

Designed for basic and advanced training of private and military pilots, night flight and instrument flight training, general commercial use, tourism and sport flying, aero-towing and other special purposes.

The VFR and IFR operations are assumed.

## MODELS OF VUT100/200 FAMILY

1-motorový, 4 - 5 místný cvičný a turistický letoun s plochým šestiválcem Lycoming O-540, 250 HP.

### VUT 200

2-motorový, 4 - 5 místný cvičný a turistický letoun s 2 x invertním řadovým šestiválcem M 337A, 2 x 210 HP.

### VUT 218

2-motorový, 4 - 5 místný cvičný a turistický letoun s 2 x plochým čtyřválcem Lycoming O-360, 2 x 180 HP.

### VUT 113

1-motorový, 2-místný cvičný letoun s invertním řadovým čtyřválcem M 332A, 135 HP.

### VUT 100

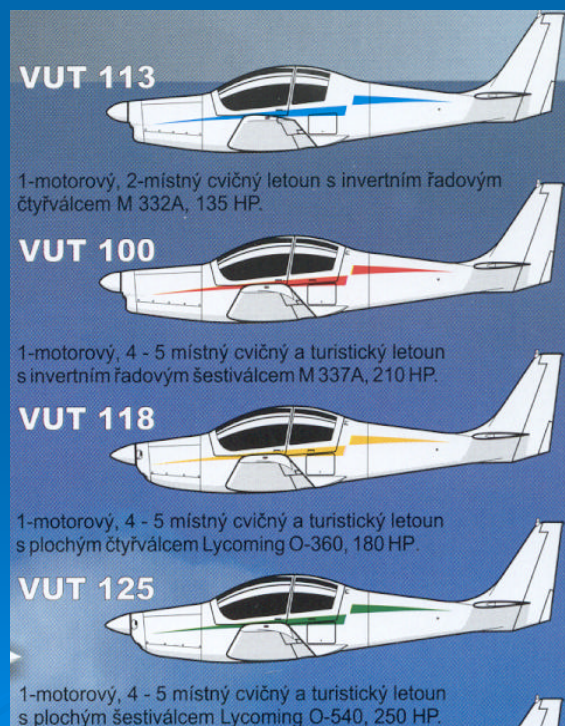
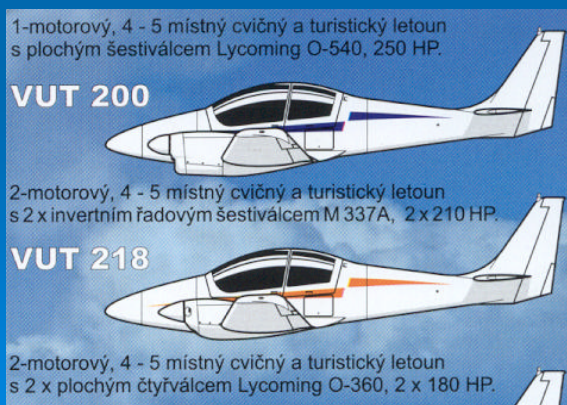
1-motorový, 4 - 5 místný cvičný a turistický letoun s invertním řadovým šestiválcem M 337A, 210 HP.

### VUT 118

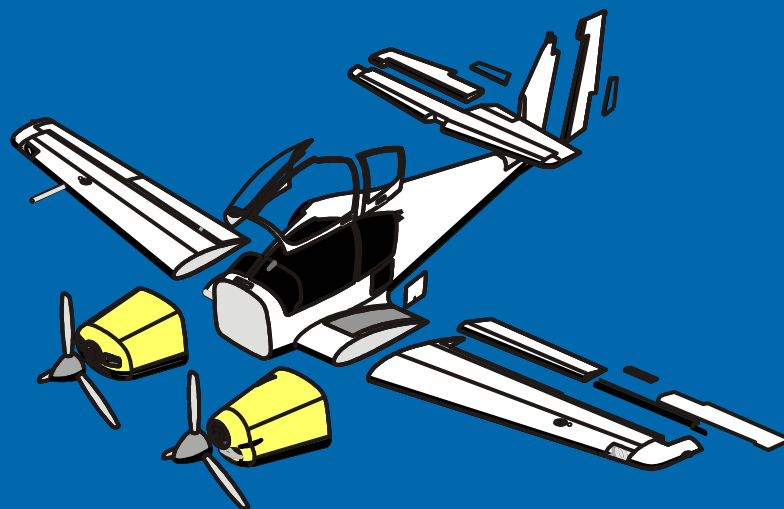
1-motorový, 4 - 5 místný cvičný a turistický letoun s plochým čtyřválcem Lycoming O-360, 180 HP.

### VUT 125

1-motorový, 4 - 5 místný cvičný a turistický letoun s plochým šestiválcem Lycoming O-540, 250 HP.



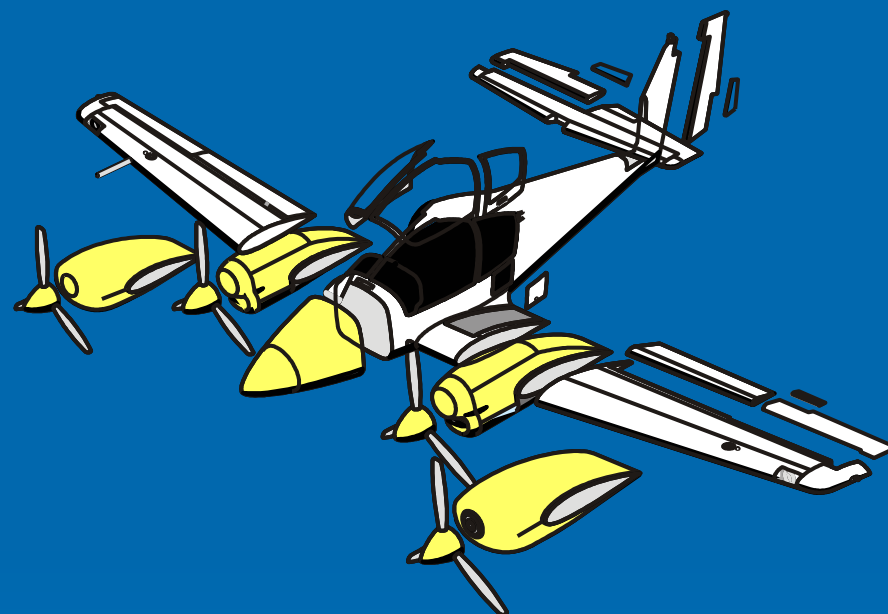
## HEREDITY OF VUT 100 FAMILY INDIVIDUAL MODELS



Inheritable construction components  
which can be used in all models of  
aircraft family



construction components for the single  
engine aircraft models



Inheritable construction components  
which can be used in all models of  
aircraft family



construction components for the twin  
engine aircraft models



## **EDUCATIONAL IMPACT OF PROJECT**

### *Masters degree students*

Active participation on project in the frame of diploma thesis, mainly in the field of preliminary design, focused on aerodynamics.

### *Ph.D. students*

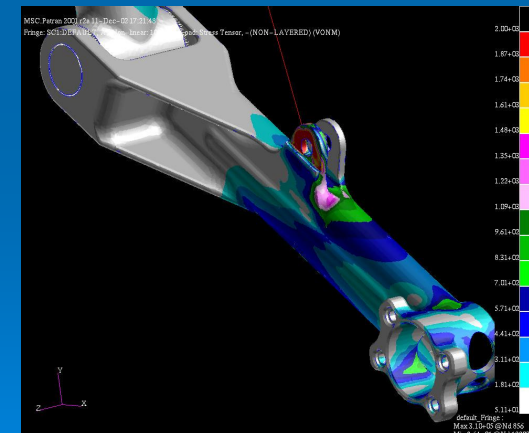
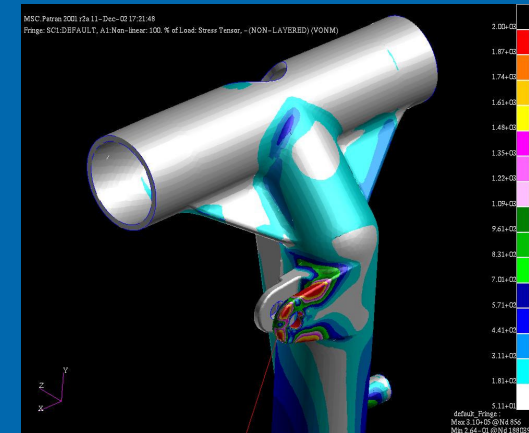
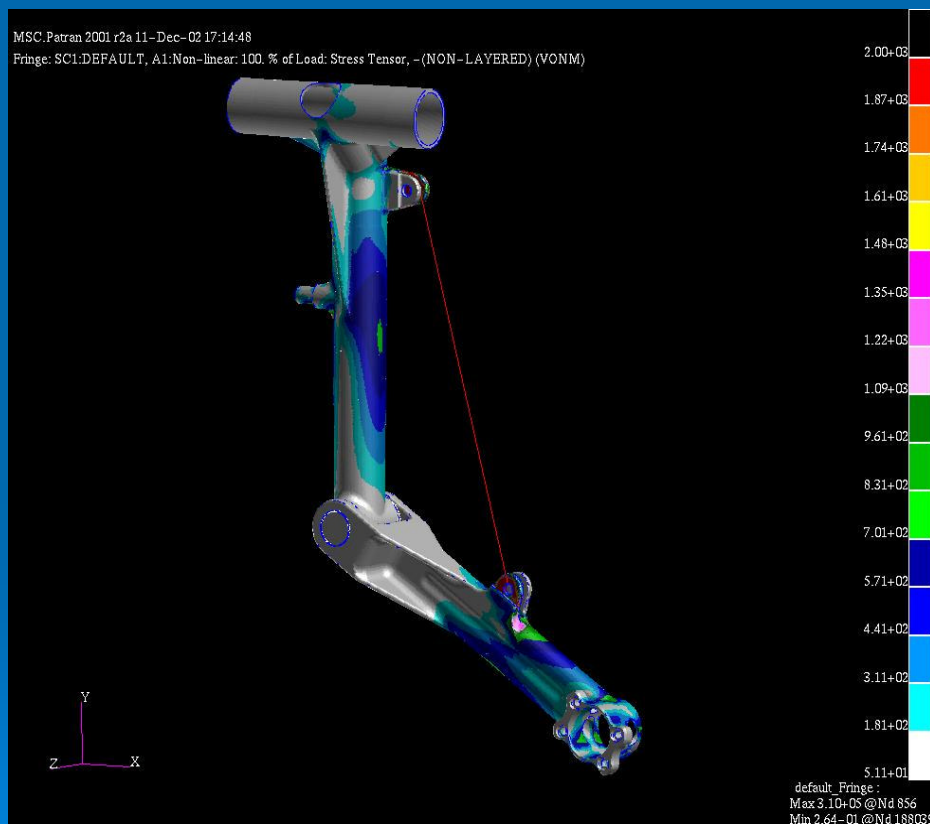
Wide participation on project in the frame of Ph.D. thesis. Structural design, crash analyses, aerodynamics, fatigue analyses, reliability analyses. The Ph.D. students were main human resource for IAE's participation on project.

### *IAE's staff*

Also IAE's staff has now big experience from real industrial project. This experience increased teaching potential of staff.

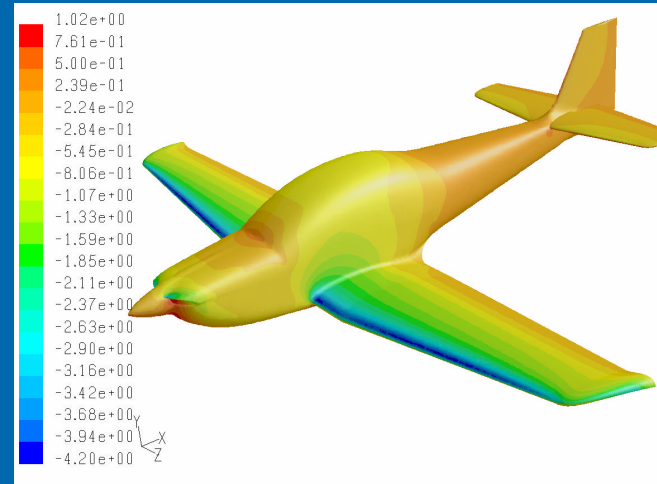
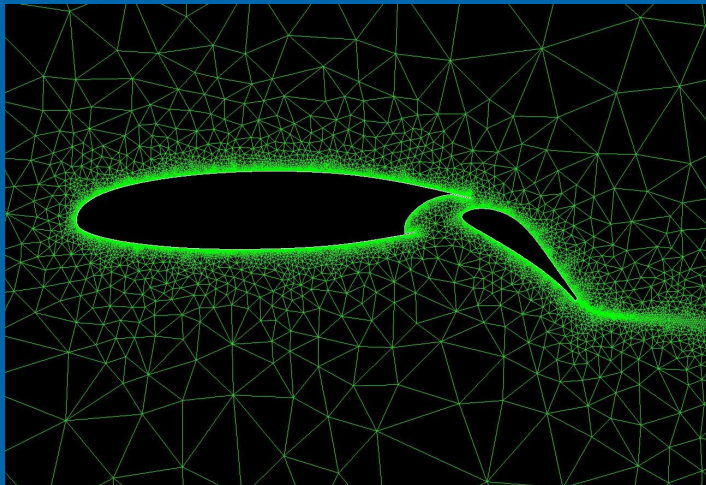
## EDUCATIONAL IMPACT OF PROJECT - EXAMPLES

There was Ph.D. thesis finished and defended in the frame of VJT100 landing gear design and stress analysis.

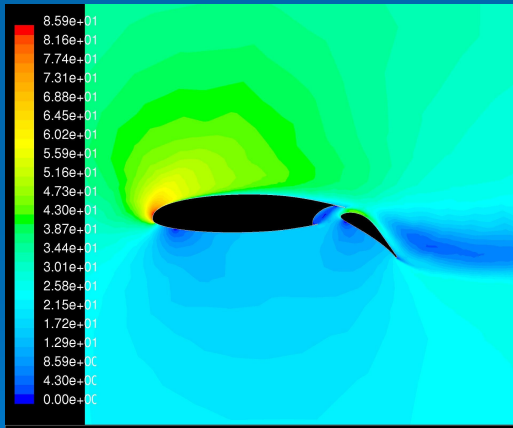
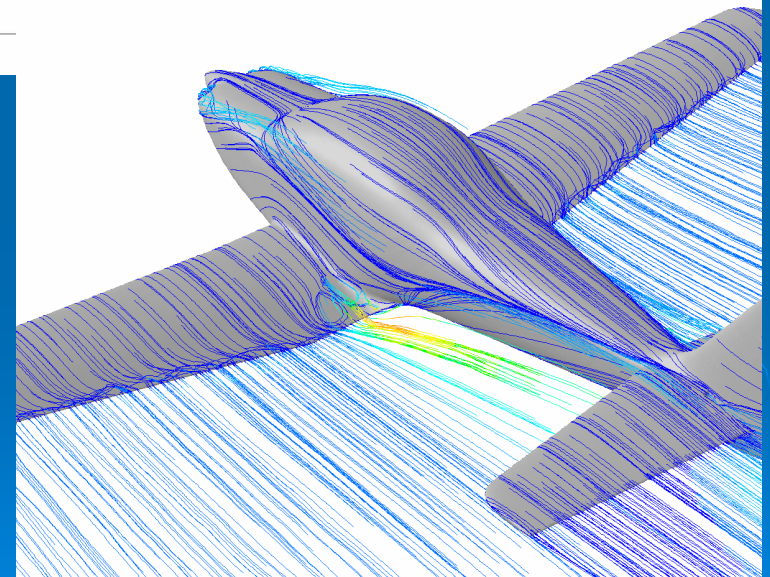




## EDUCATIONAL IMPACT OF PROJECT - EXAMPLES



Contours of Pressure Coefficient



VUT 100 Project  
aerodynamic design and  
analysis – CFD codes  
application

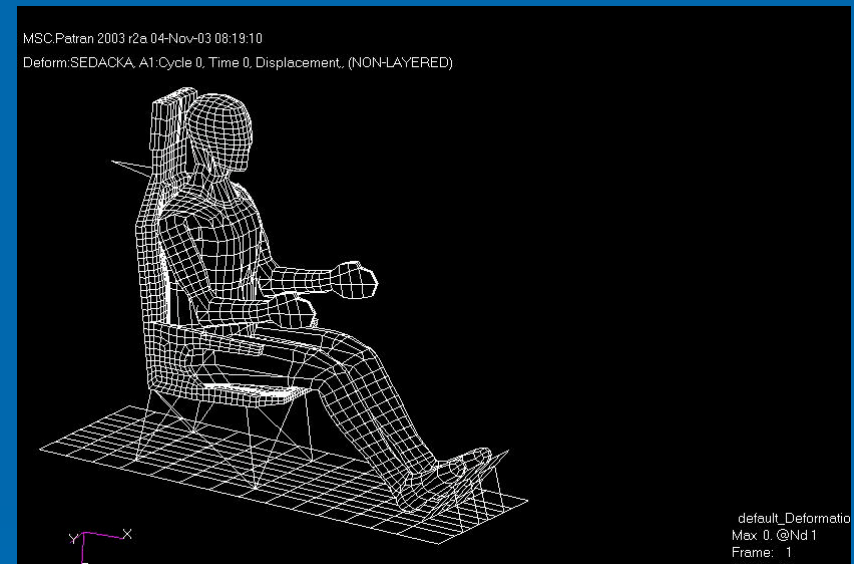
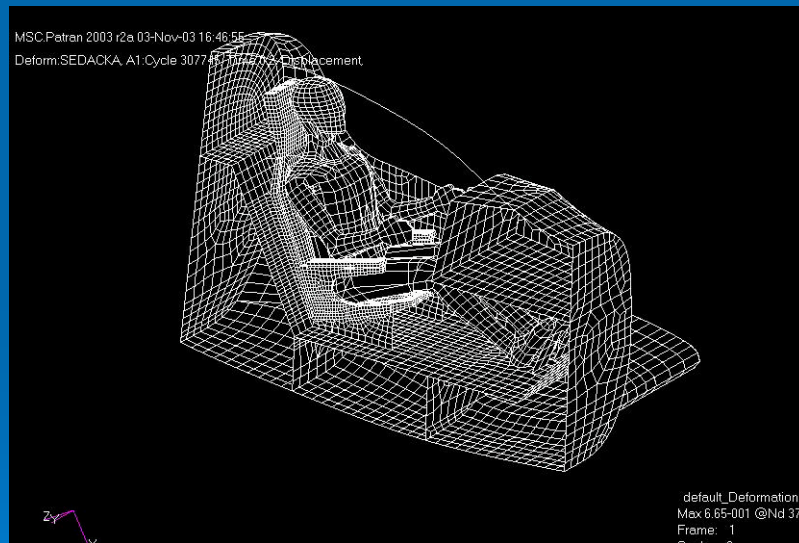
VUT 100 Project – aerodynamic design and analysis  
of single slotted flap

## EDUCATIONAL IMPACT OF PROJECT - EXAMPLES



Crashworthiness of aircraft seat – dynamic simulation using MSC.DYTRAN, Ph.D. thesis

(whole cockpit)

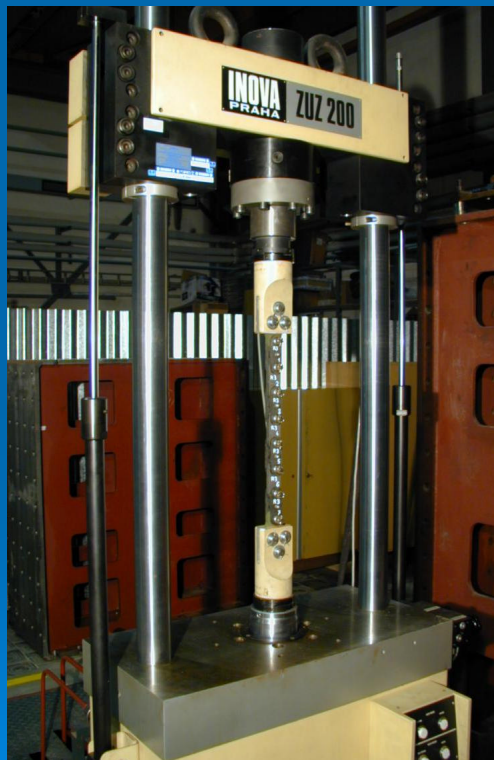


(frontal impact)

## ***EDUCATIONAL IMPACT OF PROJECT - EXAMPLES***



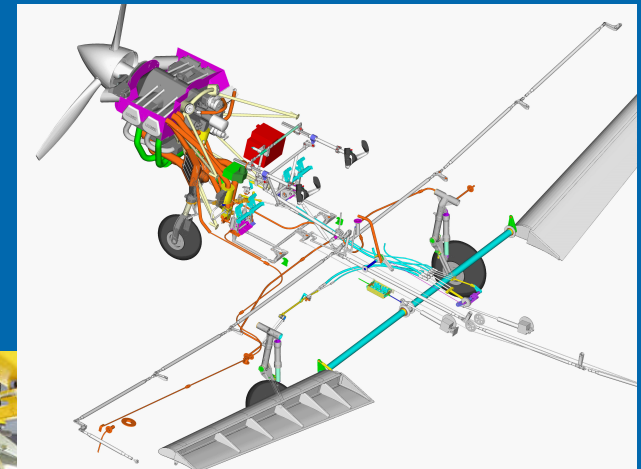
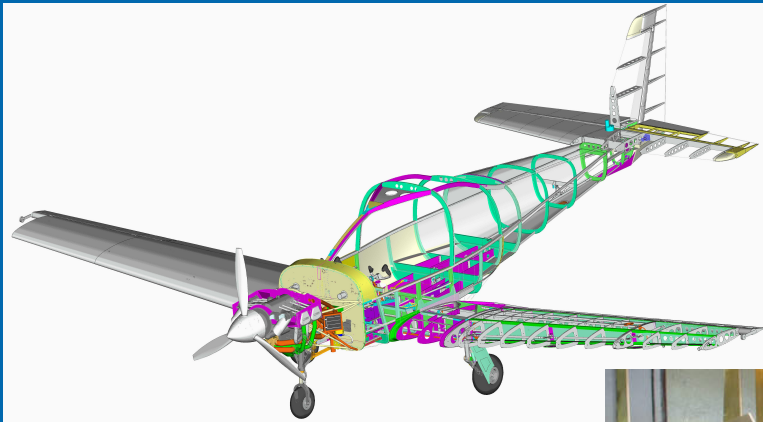
Fatigue test of the AISI 4340 lugs  
Prepared and conducted with wide collaboration of Ph.D. students.





## ***CURRENT STATE OF PROJECT***

2002-2003 ...VUT100 goes from virtual prototype to first flying prototype



## ***CURRENT STATE OF PROJECT***

Prof. Antonin Pistek speech by maiden flight of VUT100



First flight ceremony – November 16<sup>th</sup> 2004



## ***CURRENT STATE OF PROJECT***

Maiden flight of VUT100 *Cobra*



## ***CURRENT STATE OF PROJECT***



VUT100 *Cobra* is now prepared for certification process.

Institute of Aerospace Engineering is preparing for all certification structural tests.

Flying prototype undergoes extensive flight tests.





## ***CURRENT STATE OF PROJECT***



First prototype of VUT100 *Cobra* was exposed at international exhibitions at Friedrichshaffen(Germany) and Oskosh (USA).



## CURRENT STATE OF PROJECT



First prototype of VUT100 *Cobra* was exposed at international exhibitions at Friedrichshaffen(Germany) and Oskosh (USA).



Visit of president V. Klaus in  
EVEKTOR plc.





THANK YOU FOR  
YOUR ATTENTION

