Progress in SAMONIT small UAV project

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SAMONIT small UAV project

The goal is to design, build and test a small UAV for surveillance application – boarder reconnaissance in particular

Value of the project: 0,8 mln EURO

Time limits: 2007 - 2010

The project is conducted under supervision of prof. Zdobysław Goraj under the Polish Ministry of Science and Higher Education grant number R10/010/02, by a consortium of Polish scientific institutions

Assumptions

High level of safety – redundancy of propulsion, emergency parachute landing

Payload: sensor head with day and/or night camera, SAR

MTW ~ 70kg

Endurance ~20h

Loads – according to CS-23 for aerobatic category

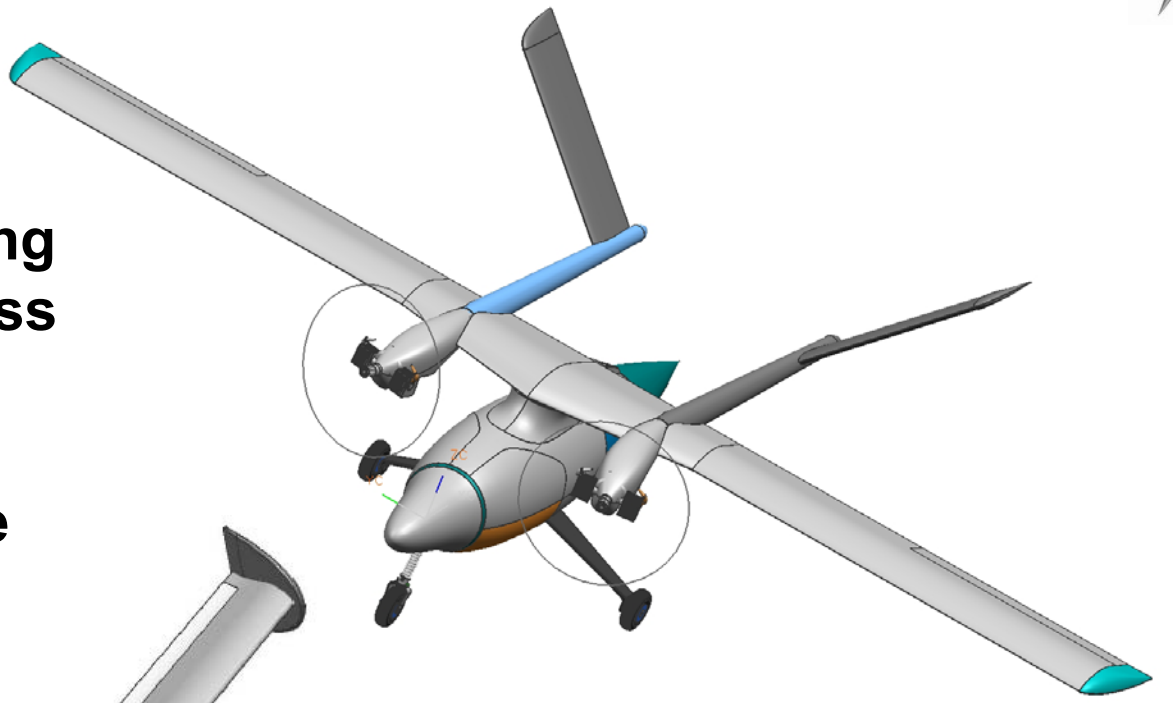
Reconfigurable UAV ?

Unknowns:

Influence of the very high wing configuration on the tailless wing aerodynamics

Flight controllability with one engine inoperative

Crosswind landings on the airstrip

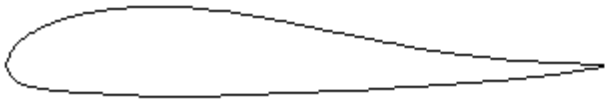


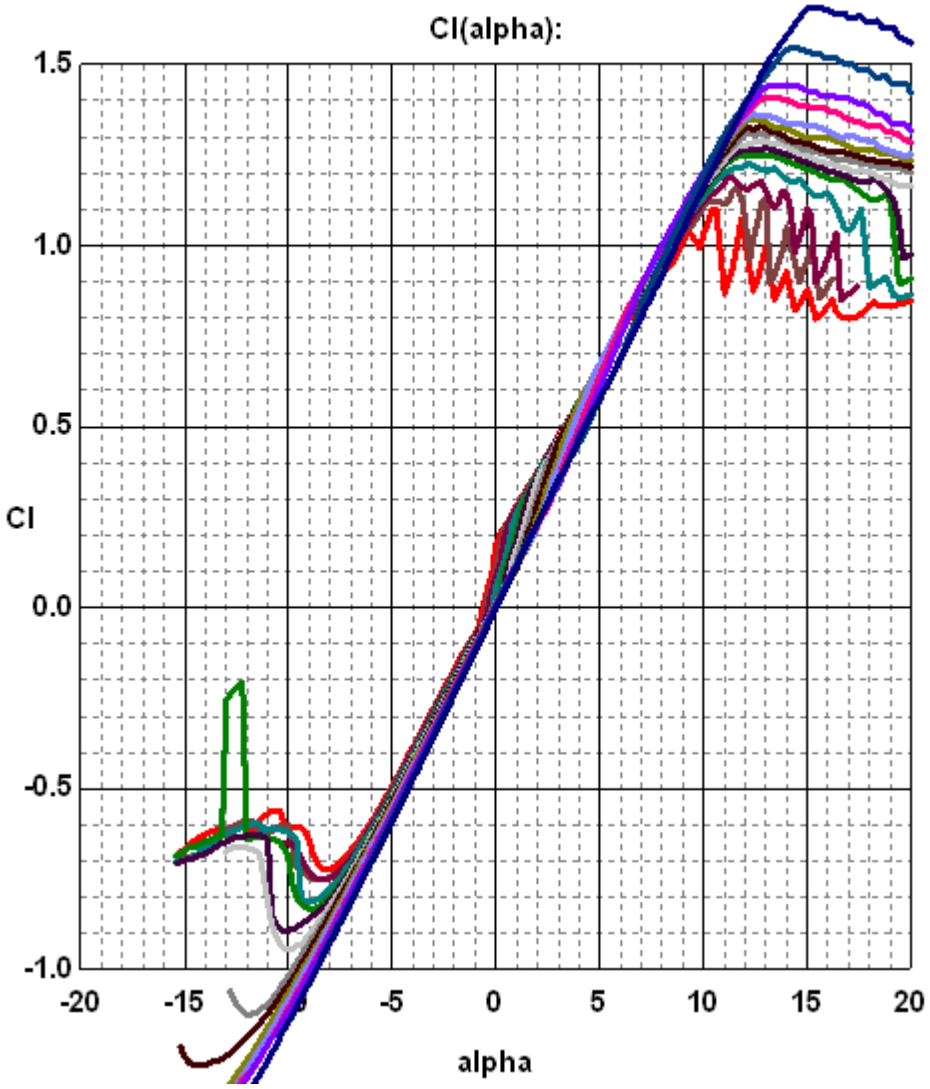
Major Advantage - more flexibility:

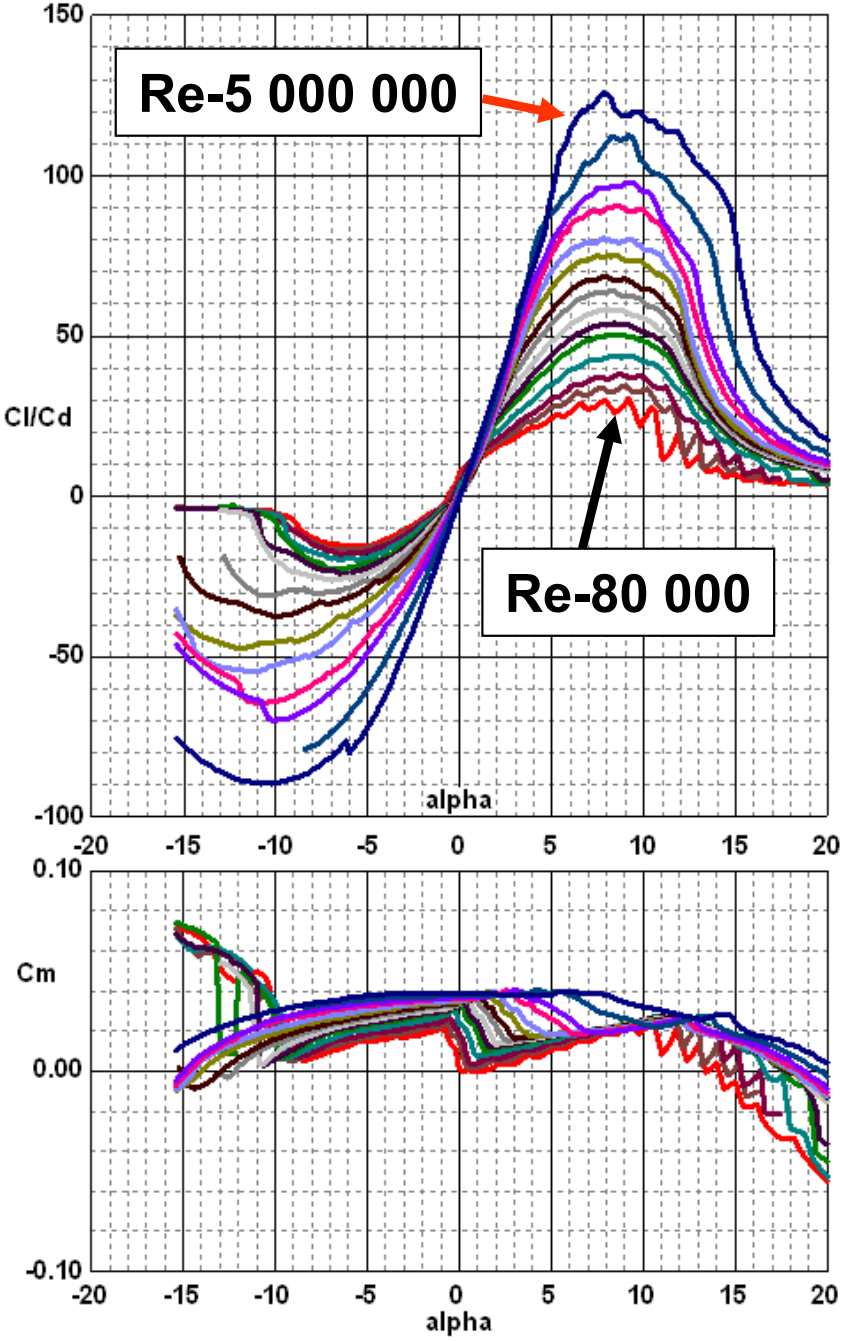
Conventional if runway available

Flying wing if T/O from launcher and parachute landing required

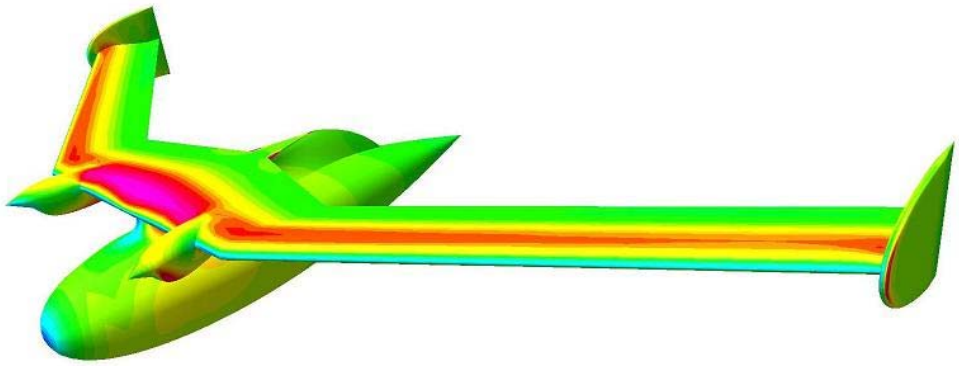
Airfoil for tailless version

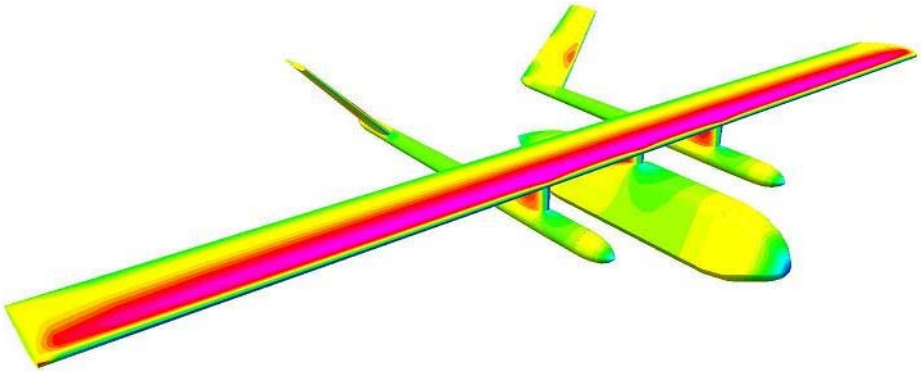


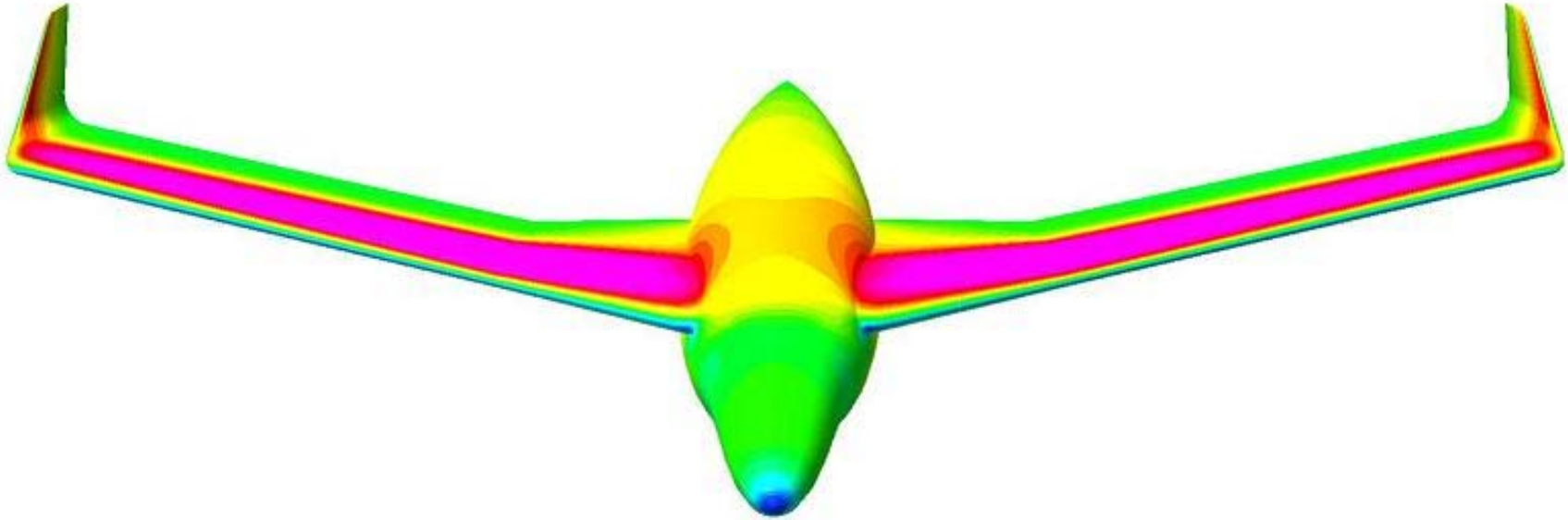




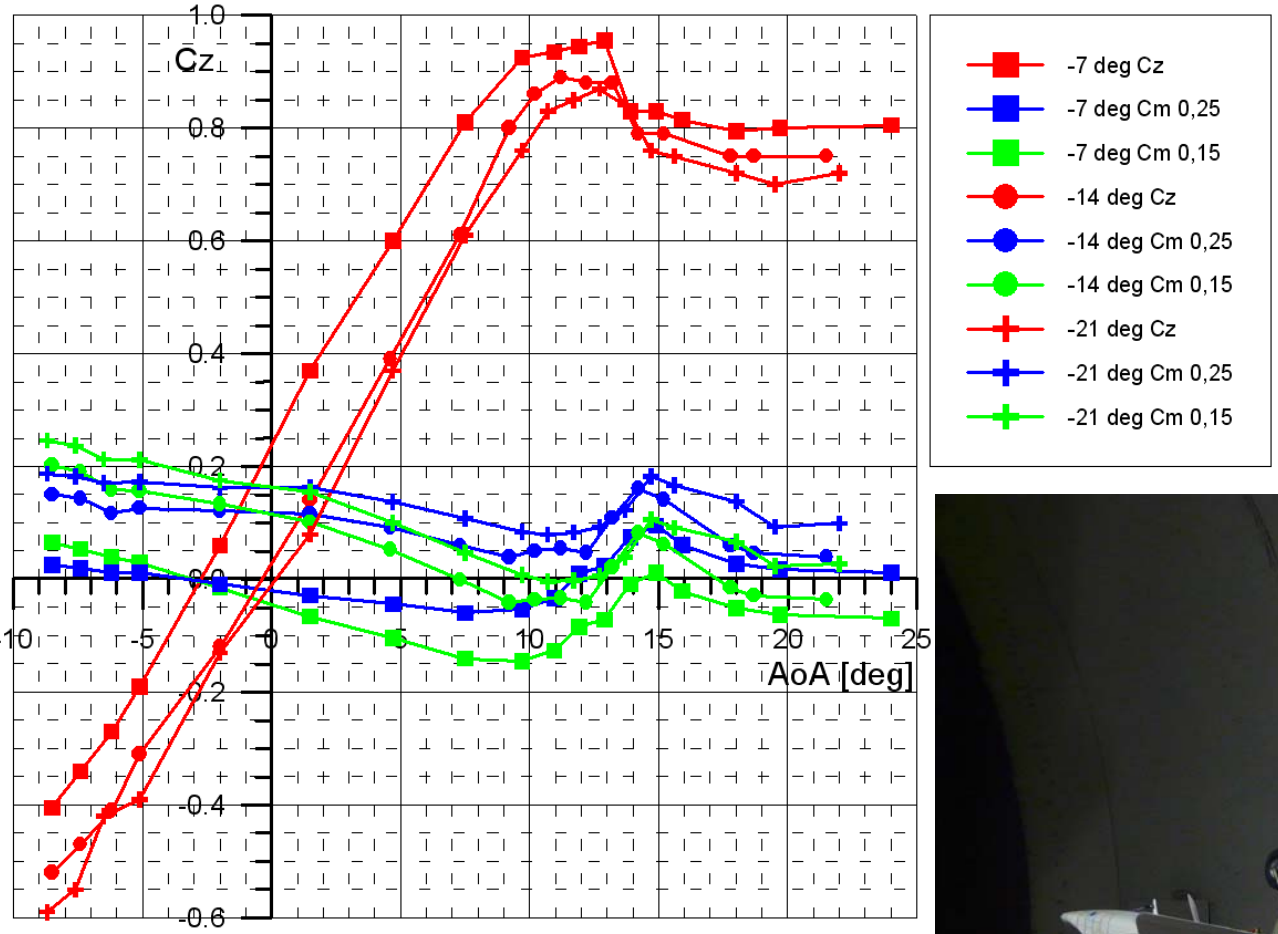
CFD simulation

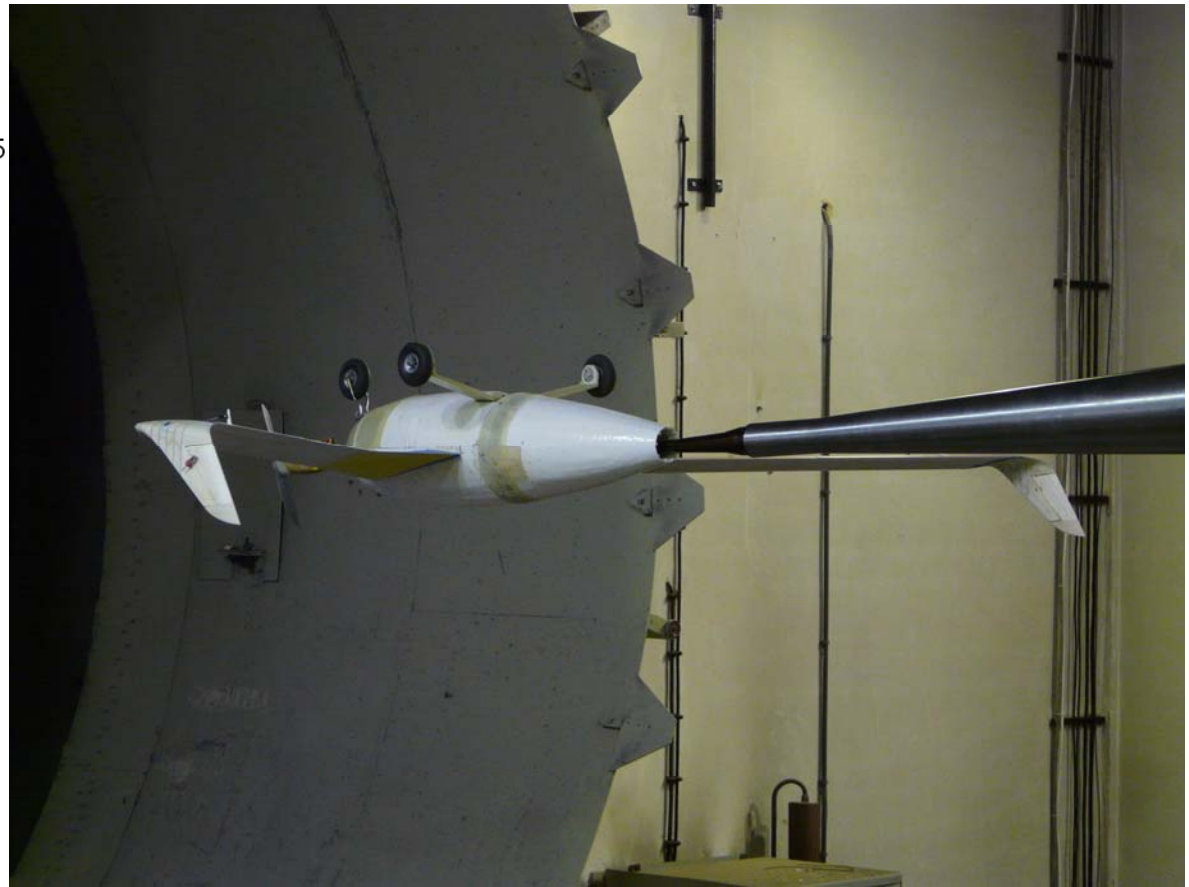






Wind tunnel tests





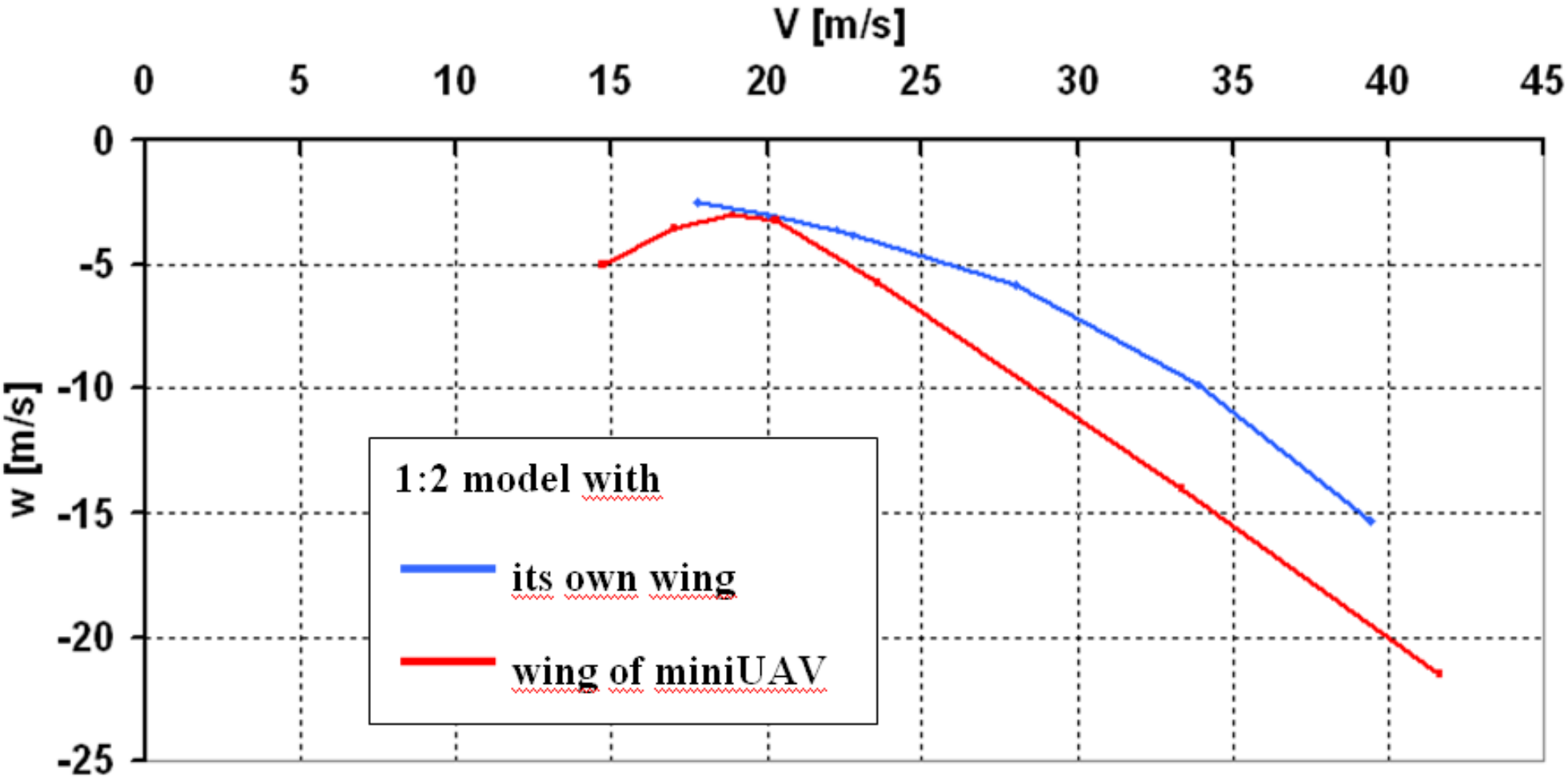
Our experience with scaled models

Distances	λ_l
Masses	$\lambda_m = \lambda_l^3$
Moments	$\lambda_M = \lambda_l^4$
Forces	$\lambda_F = \lambda_l^3$
Velocity	$\lambda_V = \sqrt{\lambda_l}$
Power	$\lambda_N = \lambda_l^{3,5}$

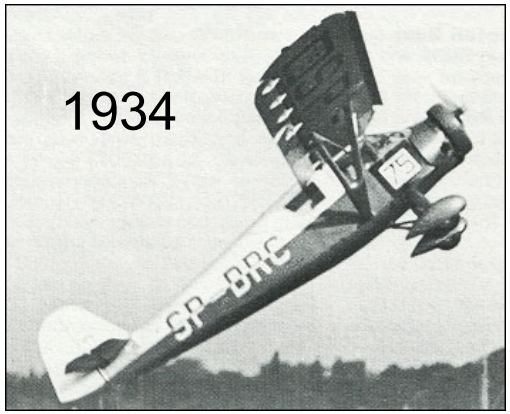
Tailless UAV evolution

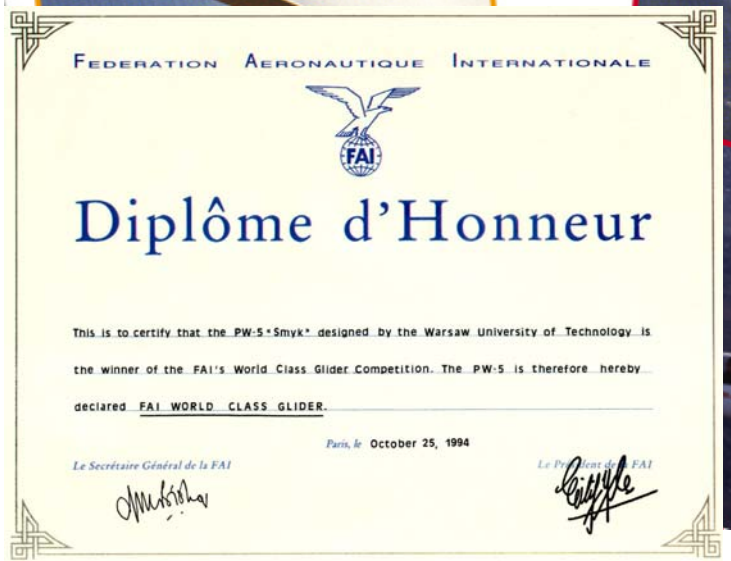
Current status of flight tests

Flight test example



WUT experience in students participation in aeronautical programs





Aero Design

3 wins in general classification

Students and SAMONIT

POLITECHNIKA WARSZAWSKA
WYDZIAŁ
MECHANICZNY ENERGETYKI I LOTNICTWA
ZAKŁAD SAMOLOTÓW I ŚMIGŁOWCÓW

PRACA DYPLOMOWA
INŻYNIERSKA

Radosław Waszkiewicz

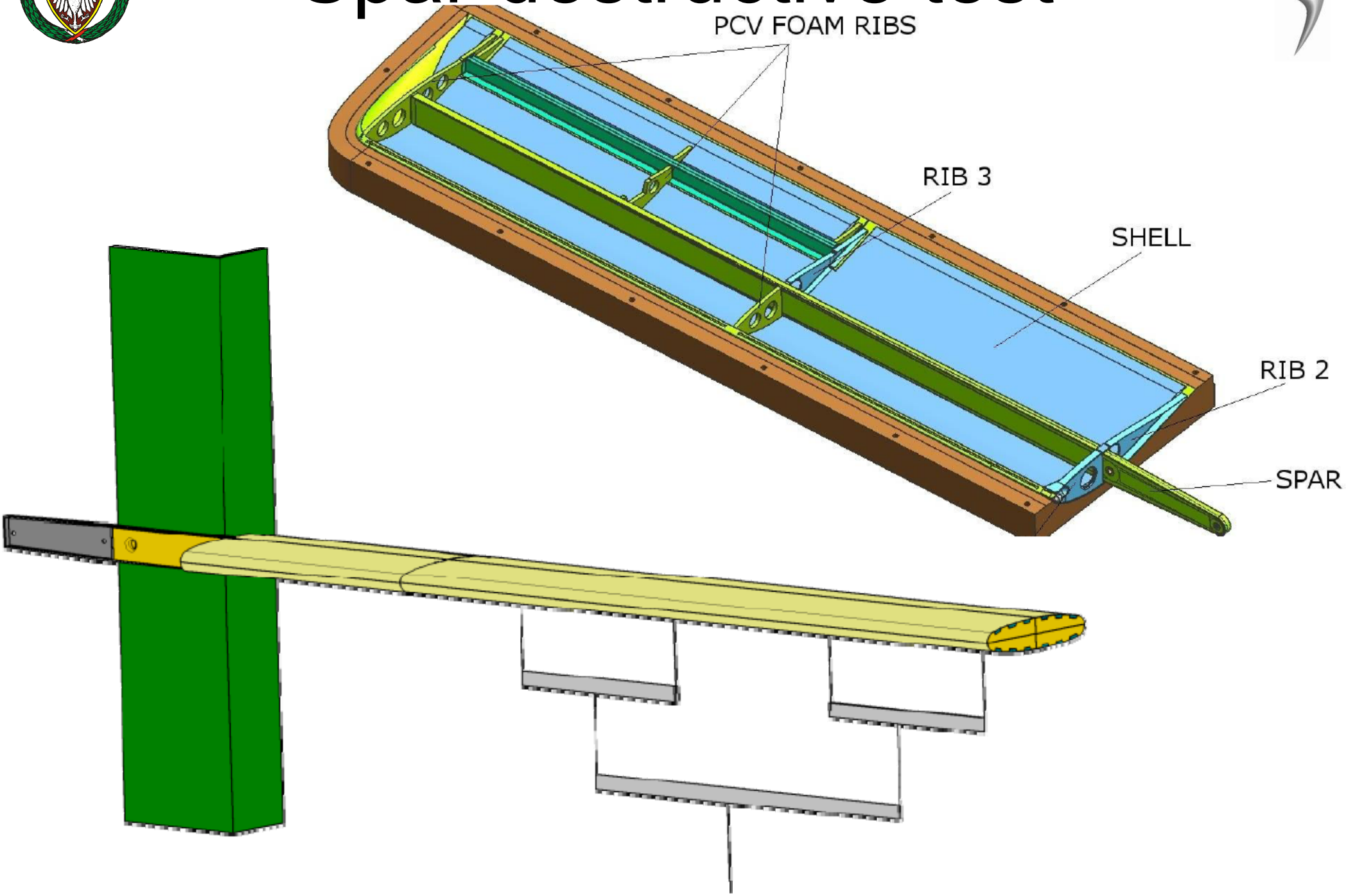
Badania wytrzymałościowe
dźwigara samolotu bezzałogowego.
Strength analysis
of an unmanned aircraft wing spar.

Nr albumu 202347
Mechanika i Budowa Maszyn

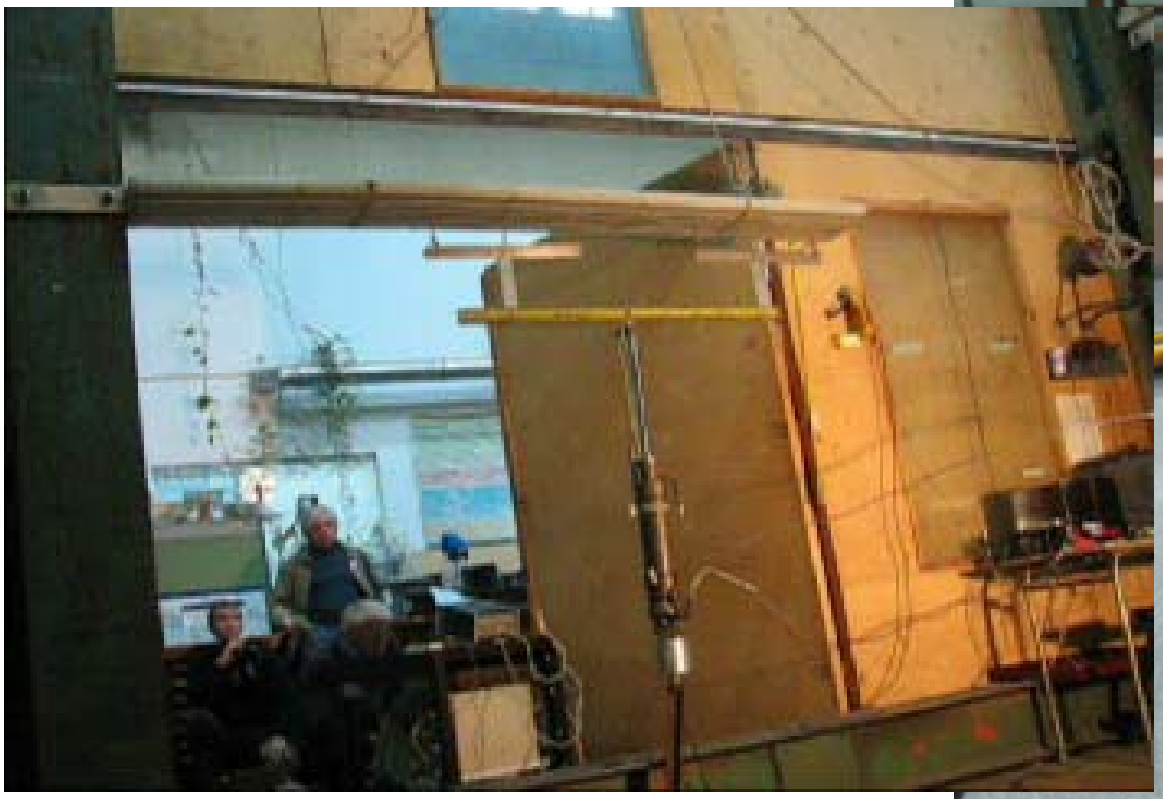
Promotor: dr inż. Mirosław Rodzewicz

Warszawa 2008

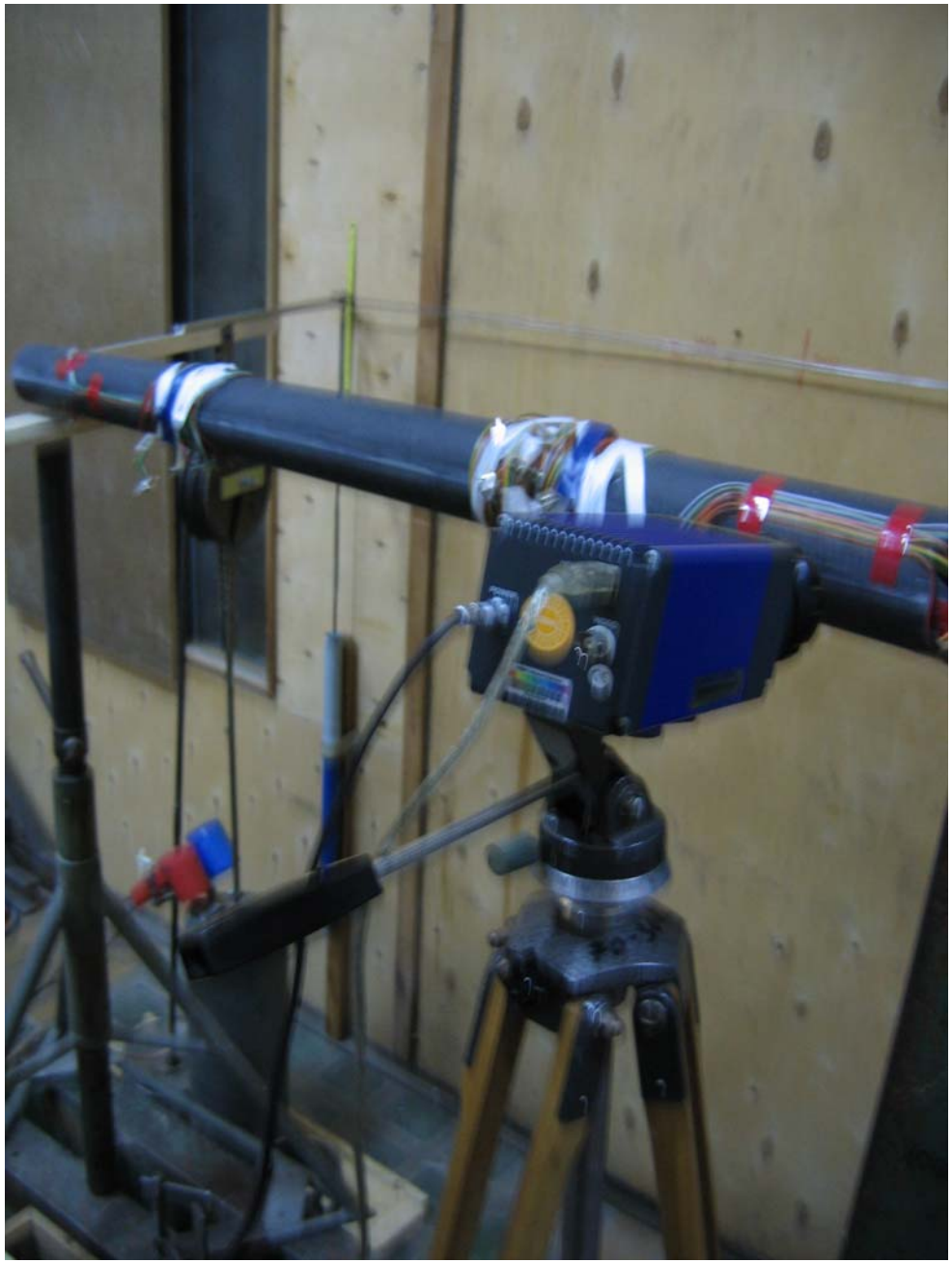
Spar destructive test



Spar destructive test



Tail boom fatigue test



Propulsion and landing gear tests

March 2009

May 2009

Conclusion

The project approaches critical milestone – first flight of the full scale UAV.

Research conducted so far allowed to investigate some very interesting concepts and acquire precious knowledge.

Students' participation allowed to save time and money while providing them an excelent opportunity to gain hands-on experience in real live research project.

Main contributors

Project coordinator: Prof. PhD, DSc, eng. Zdobysław Goraj (WUT)
Chief designer: MSc. eng. Andrzej Frydrychewicz (WUT)

Structure development:
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MSc. eng. Wojciech Grendysa (WUT)
MSc. eng. Marek Jonas (WUT)

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Manufacturing coordination:
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MSc. eng. Andrzej Homziuk (AFIT)

FEM analysis:
Prof. PhD, DSc, eng. Aleksander Olejnik (MUT)

CFD analysis:
PhD. eng. Marcin Figat (WUT)

Wind tunnel testing:
PhD. eng. Andrzej Krzysiak (IA)
PhD. DSc. eng. Galiński (WUT)
MSc. eng. Hajduk (AFIT)

Flight testing:
PhD. DSc. eng. Galiński (WUT)
MSc. eng. Hajduk (AFIT)

IA – Institute of Aviation
AFIT – AirForce Institute of Technology
MUT – Military University of Technology
WUT – Warsaw University of Technology

READ'10

Research and Education for Aircraft Design

XX October 2010
Warsaw, Poland

THANK YOU

FOR YOUR ATTENTION