



# Research in Fluid Dynamics

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**Jacek Rokicki**

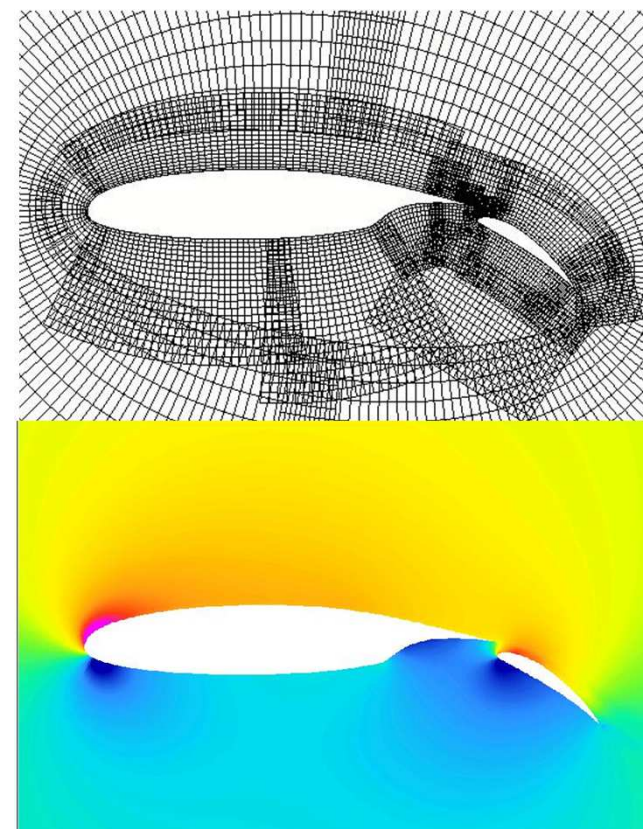
Department of Aerodynamics

Institute of Aeronautics and Applied Mechanics

Faculty of Power and Aeronautical Engineering

Warsaw University of Technology

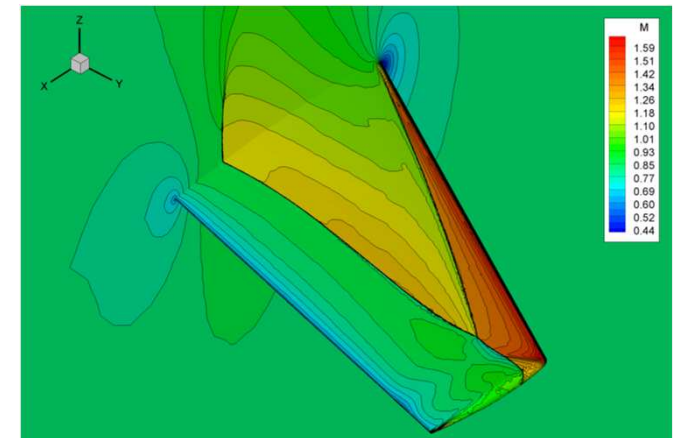
Warsaw 12.06.2010





# Department of Aerodynamics

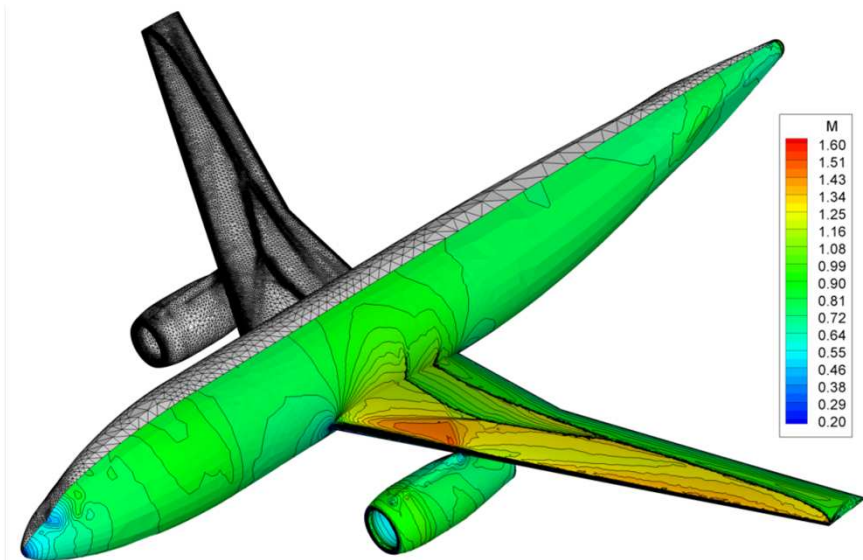
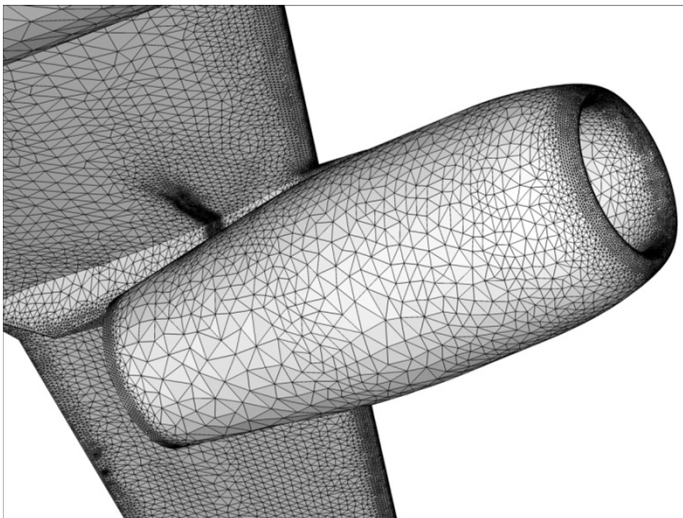
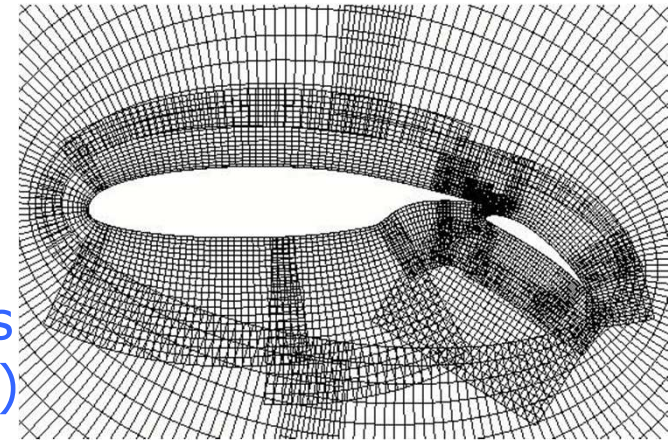
- Exists since 1927
- Research:
  - Computational Fluid Dynamics
  - Experimental Investigations
  - Aerodynamic Design and Optimisation
- Staff:
  - 5 full Professors
  - 8 researchers with Ph.D.
  - 14 Ph.D. students
  - 4 technicians
- Equipment
  - Range of Wind tunnels (subsonic, laminar, transonic, ...)
  - **New laminar and new transonic wind tunnels (2012)**
  - Own computing centre (3 HP clusters)



# Recent research subjects

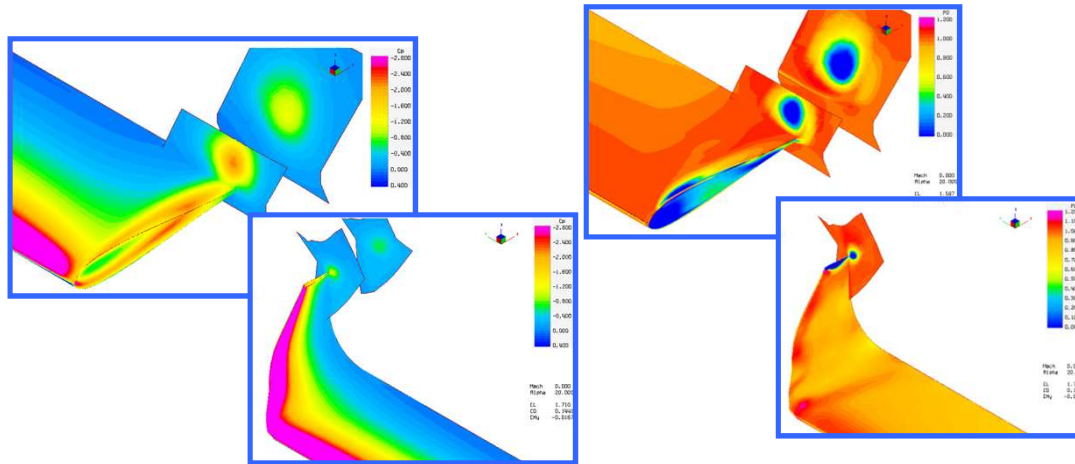


- Chimera meshes for helicopter simulations (cooperation with Prof. Barakos, LIV)
- Adaptive mesh generation (ADIGMA, IDIHOM)
- Design and optimisation for aeronautic configurations (NACRE) – genetic algorithms and adjoint equation approach (FLOWHEAD)
- Laminar wings and morphing



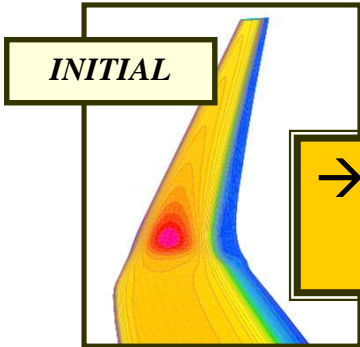
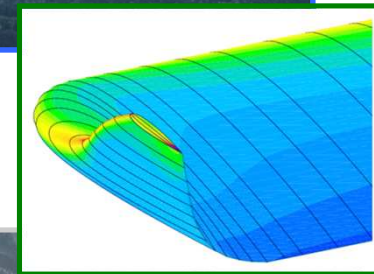
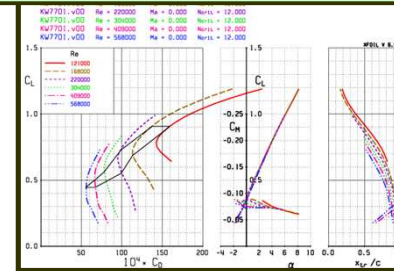
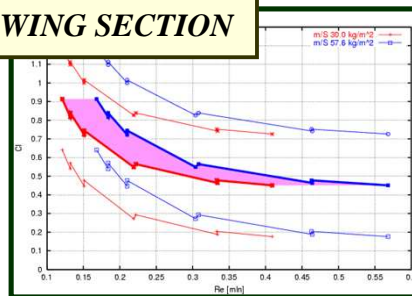


# Fixed Wing Aerodynamics



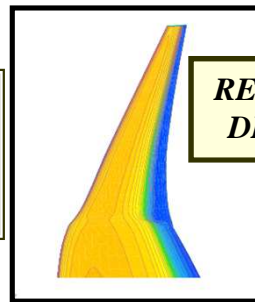
## OPTIMIZED AIRFOIL FOR WING STATION

### REQUIREMENTS FOR WING SECTION



INITIAL

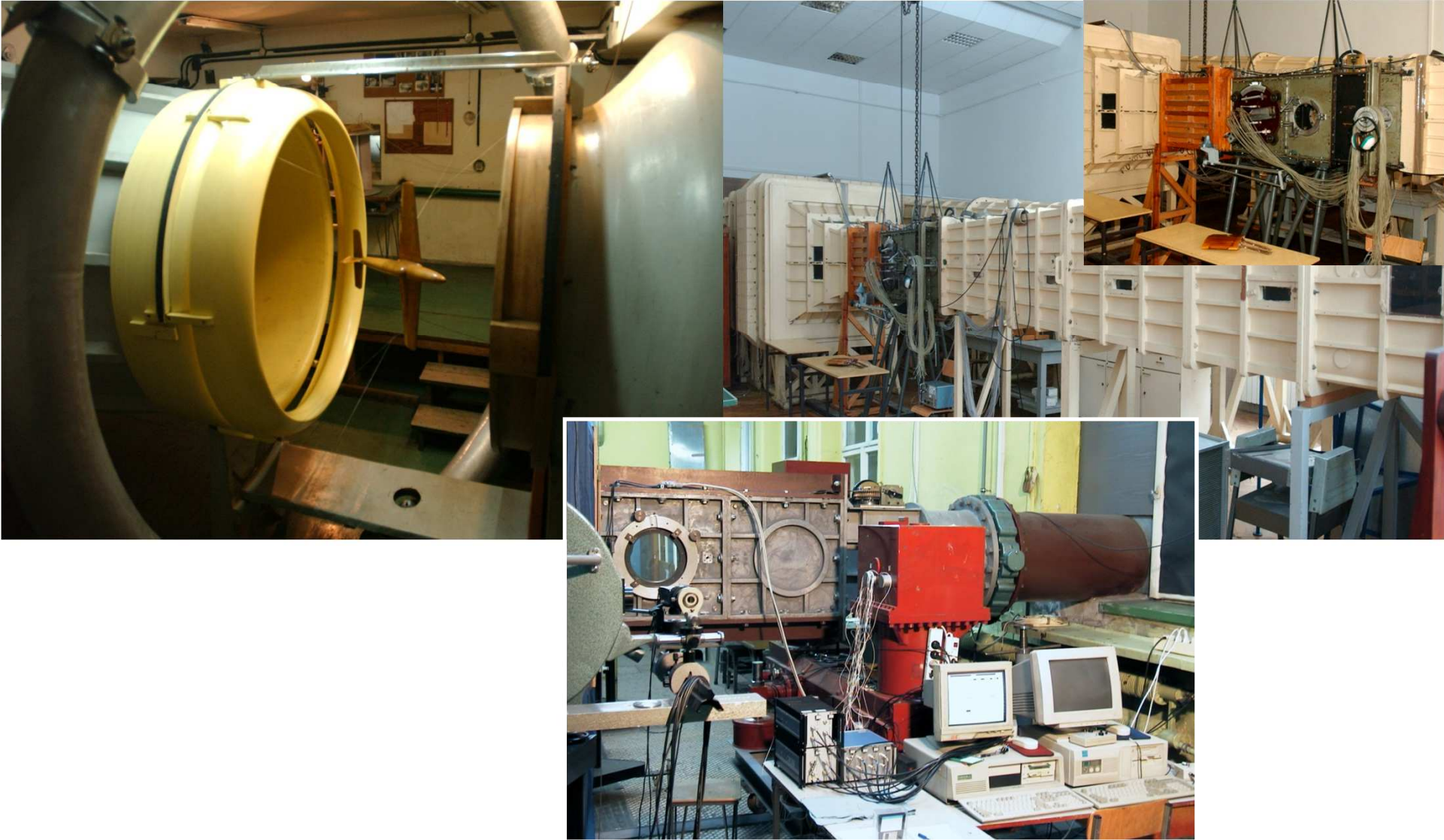
→ 3D - DESIGN PROCESS →



REQUIRED = DESIGNED



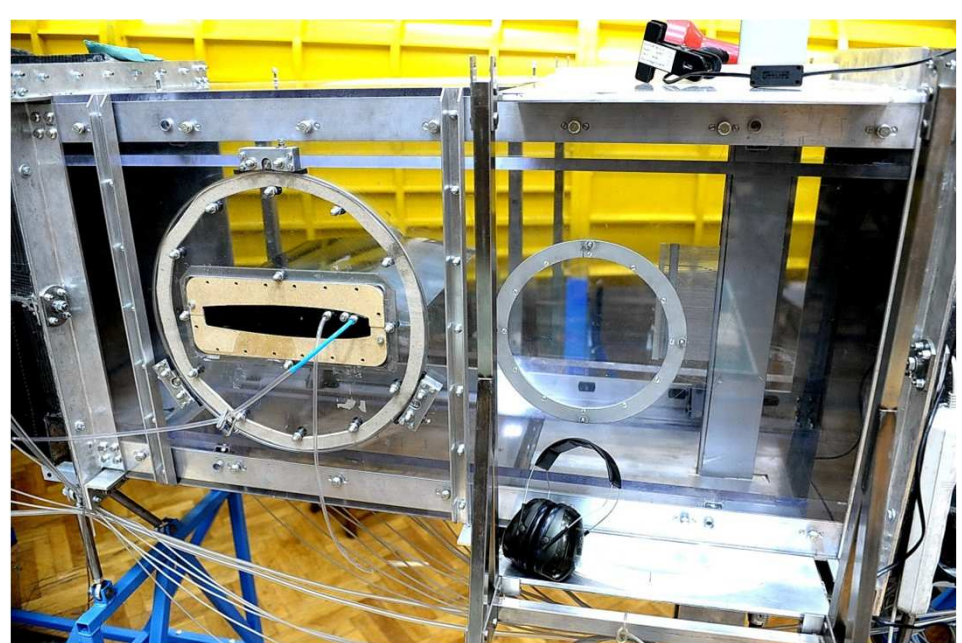
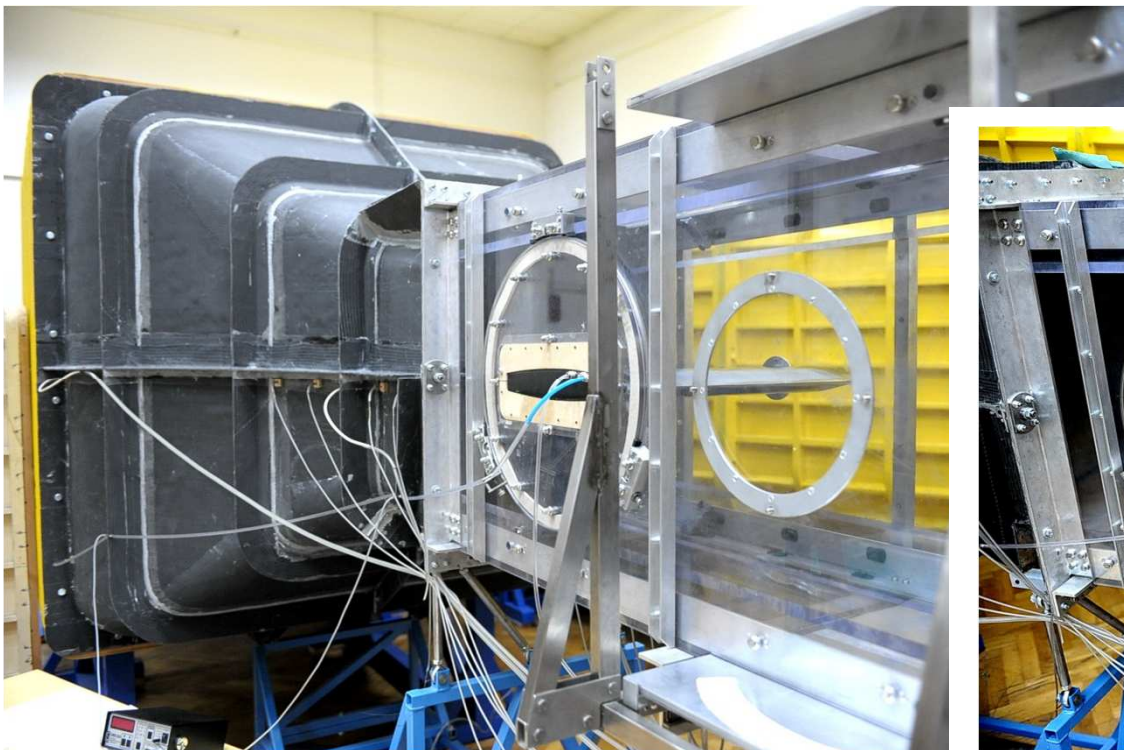
# Experimental facilities







*Laminar wind tunnel  
Test section 0.45 x 0.35m  
Maximum speed: 80m/s*



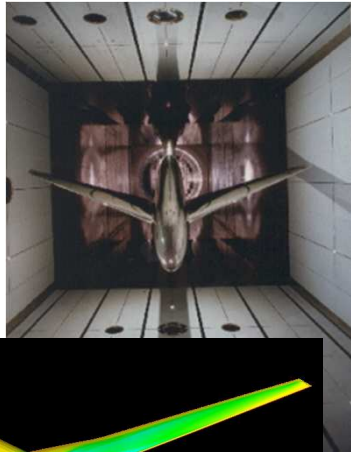


# European Projects

**IDIHOM**

2010-2012

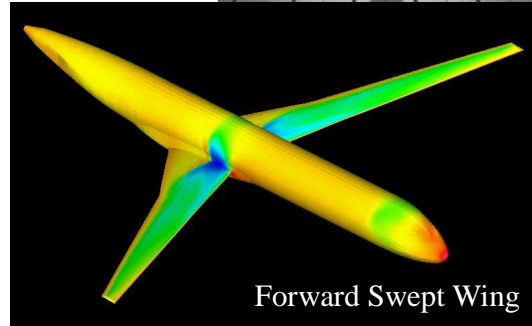
Industrialisation of High-OrdEr Methods – A Top-Down Approach



**HiReTT**  
1999-2003



2006-2009



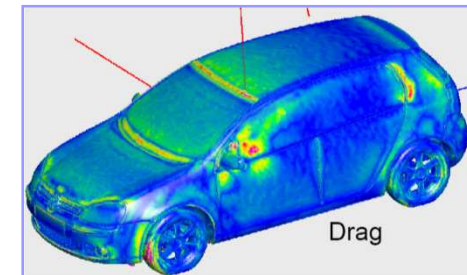
**M-DAW**



2003-2005



**NACRE**  
2005-2009



**FLOWHEAD**

2008-2011  
Fluid Optimisation Workflows for  
Highly Effective Automotive Development Processes



# New Labs



# STRUCTURAL FUNDS PROJECT POIG 2.2



Military University of Technology  
Warsaw University of Technology

Experimental Infrastructure for Aero-Engine Research

2 Labs (8 mln Euro – 2010-2014):

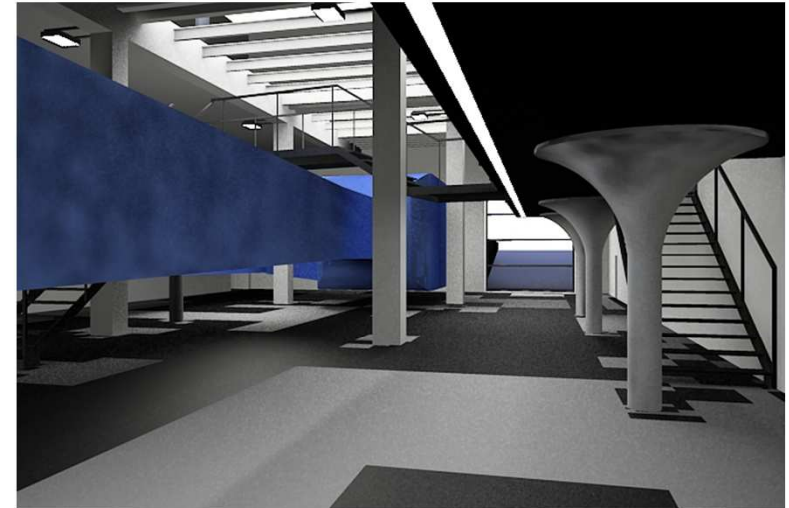
- Laboratory of Turbine Aerodynamics and Combustion (LATiS) PW: ZA-ITLiMS + ZSL-ITC
- Laboratory of Aircraft Engines (LBNL) WAT.

Consortium

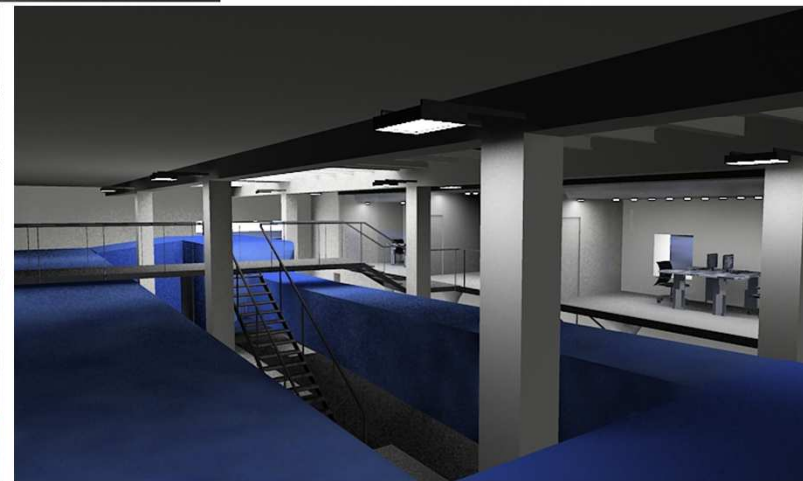
1. POLONIA AERO Sp. z o.o.
2. [Warsaw University of Technology](#)
3. [Military University of Technology](#)



# Main LATiS laboratory



Tunnel of controlled turbulence level





**PoloniAero**  
Laboratory

# Cold Flow Turbine Laboratory „Polonia Aero”



**Avio**  
propulsione aerospaziale



Designed by  
**ASE**



# Cold Flow Turbine Laboratory „Polonia Aero”



- Largest laboratory in Europe
- Cost: approx. 50 mln euro
- EU structural funds

