

CLEAN SKY Info Day 2011. 09. 12



Aeronautical Research in Baltic Countries

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Prof. Martins Kleinhof

Phd. Allan Nommik






RIGA TECHNICAL UNIVERSITY



Eesti Lennuakadeemia
Estonian Aviation Academy

Warsaw

Goals

-  **To introduce the structure of the aeronautical research systems in Lithuania, Latvia and Estonia.**
-  **To present opportunities for Baltic countries in aeronautical research.**
-  **To present the perspectives of international cooperation in the Clean Sky Programme.**

Lithuanian National Aeronautical Technology Platform (1)



Lithuanian National Aeronautical Technology Platform (2)

Partners

- ✈ Civil Aviation Administration
- ✈ Association of Lithuanian Aviation Industry Companies
- ✈ Stock company “Helisota”
- ✈ Stock company “Kauno aviacijos gamykla”
- ✈ Stock company “Termikas”
- ✈ Stock company “Sportinė aviacija”
- ✈ State enterprise “Oro navigacija”
- ✈ Vilnius Gediminas’ Technical University
- ✈ Kaunas University of Technology
- ✈ Vilnius University
- ✈ Institute of Mathematics and Informatics
- ✈ Institute of Chemistry
- ✈ Lithuanian Academy of Sciences
- ✈ Ministry of Interior Affairs
- ✈ Border Police Aviation

Lithuanian National Aeronautical Technology Platform (3)

Thematic Groups

 **Reliability and Durability of Structures**

 **Composite Materials in Aviation**

 **Aerodynamics**

 **Laser Technologies**

 **Mechatronics Technologies**

 **Air Traffic Control Technologies**

 **Satellite Technologies in Aviation**

 **Information Technologies**

 **Aviation Materials**


 **Acoustic Technologies**

 **UAV Design and Monitoring**

 **Cockpit Ergonomics and Flight Control System**

 **Aircraft Maintenance**






 **Geodesic and Cartographic Technologies**

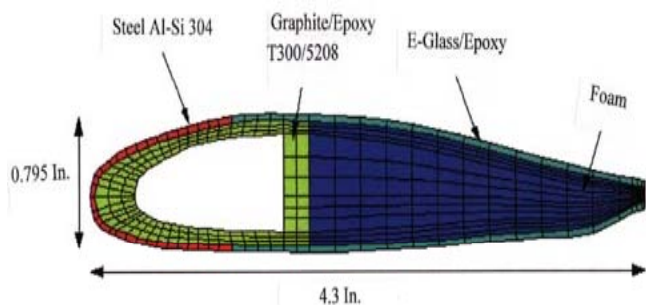
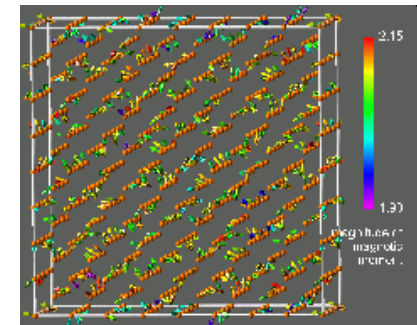
 **Strategic Research of Air Transport Development**

 **Aviation Specialist's Training**

Reliability and Durability of Structures

Leader - Prof. A. Ziliukas
Kaunas University of Technology

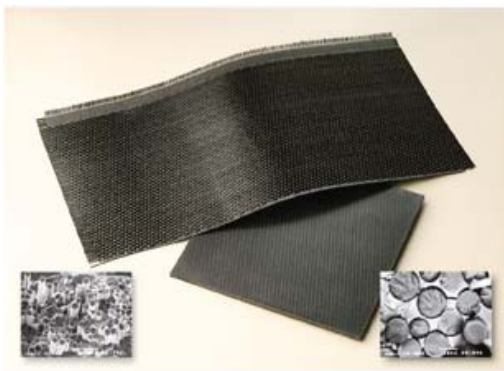
-  Aircraft reliability
-  Mechanics of decay
-  Numeric mechanics of distorted body
-  Determination of fuselage reliability
-  Research of engine reliability



Composite Materials in Aviation






Leader – S. Sakalskis
AB "Sportine aviacija"

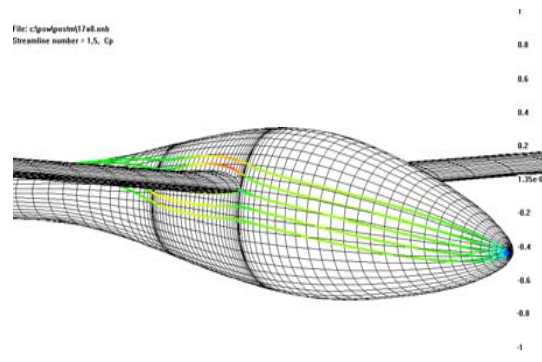
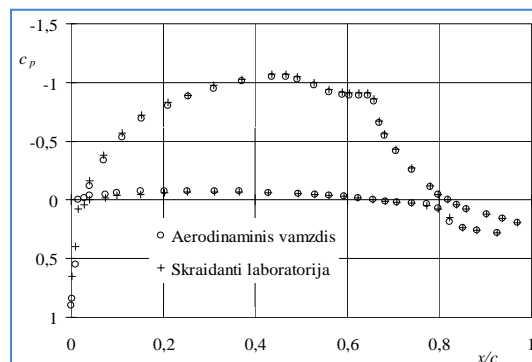
- ✂ Composite materials
- ✂ Composite constructions
- ✂ Research on the reliability and durability of composite materials



Aerodynamics

Leader – Asoc. prof. E. Lasauskas
Vilnius Gediminas' Technical University

-  Low-speed aerodynamics
-  Computer simulation of air flow
-  Design and analysis of wing profile
-  Research of aircraft stability and control characteristics
-  Analysis of aircraft flight dynamics parameters



Laser Technologies





Leader – Prof. A.P.Piskarskas
Vilnius University

- ✂ Calorimetric measurements of the optical coating losses in the wide spectral range
- ✂ Measurements of laser induced damage thresholds in wide spectral and temporal range
- ✂ Investigation of laser-induced electrical discharge
- ✂ Investigation of light filaments in solids, liquids and gases



Mechatronics Technologies

Leader - Prof. R. Bansevicius
Kaunas University of Technology

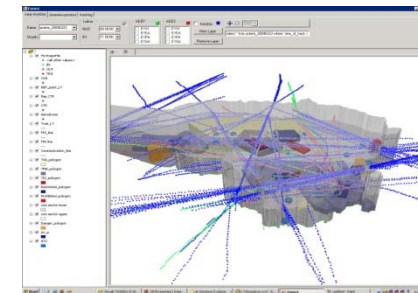
-  Enlargement of surface hardness
-  Piezoelectric sensors with variable geometrical parameters
-  Piezoelectric sensors with control boundary conditions
-  Piezoelectric robot's eye



Air Traffic Control Technologies

Leader- V. Kondroska,
State Enterprise "Oro Navigacija"

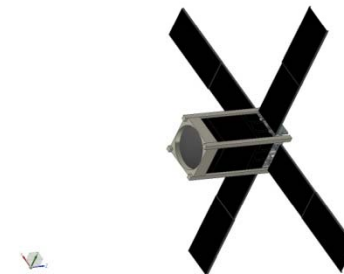
- ✈️ UAV implementation into the control air space
- ✈️ legalisation of the range of various UAV in the control air space with manned air vehicles
- ✈️ harmonisation air traffic control rules without hazards for other air space users (manned air vehicles),
- ✈️ development and deployment of CNS/ATM technologies



Satellite Technologies in Aviation

Leader – Assoc Prof A. Jakucionis
Vilnius Gediminas' Technical University

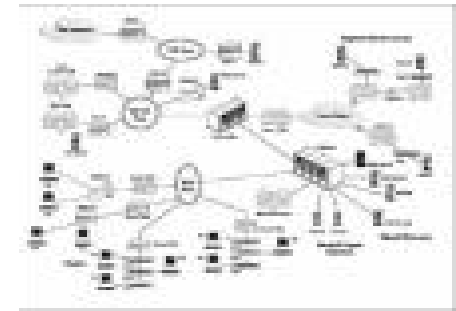
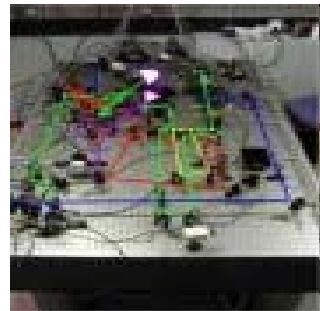
- ✎ Evaluations of GPS regional positioning accuracy with developments of GPS signals and GPS augmentations
- ✎ Implementation of GALILEO and GNSS-2 systems for regional use and ground based navigation and precision approach systems decommissioning problems and solutions
- ✎ Research of needs for additional differential GPS stations with respect to the quality of EGNOS signals for general aviation aircraft precision approach in regional airfields
- ✎ Creation of flight control and communication equipment based on satellite and integrated technologies for regional missions UAV



Information Technologies

Leader - Prof. L. Telksnys
Institute of Mathematics and Informatics

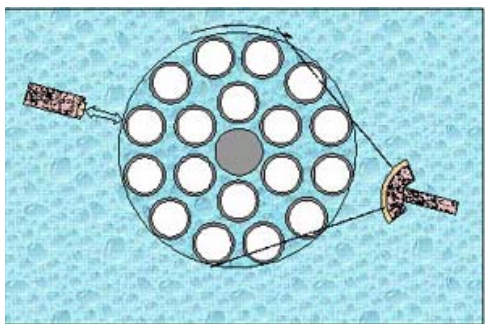
- ✂ Development of software for aircraft technical diagnostic systems
- ✂ Development of flight management systems software
- ✂ Development of UAV control systems software
- ✂ Analysis and recognition of observation information
- ✂ Development of ground flight control system software
- ✂ Development of Multilanguage supported control systems



Acoustic Technologies

Leader - Prof. R. Kazys,
KTU Ultrasound Institute

- 🔧 Ultrasonic methods for research of composite materials and structures
- 🔧 Ultrasonic vision systems
- 🔧 Ultrasonic navigation
- 🔧 Ultrasonic gas thermometry



Lithuanian NATP Thematic Group

UAV Design and Monitoring

Leader – Assoc. prof. E. Lasauskas
Vilnius Gediminas' Technical University

Lithuanian NATP Thematic Group

UAV Design and Monitoring

Leader – Assoc. prof. E. Lasauskas
Vilnius Gediminas' Technical University

- # **Lithuanian NATP Thematic Group**

UAV Design and Monitoring

Leader – Assoc. prof. E. Lasauskas
Vilnius Gediminas' Technical University



Cockpit Ergonomics and Flight Control System

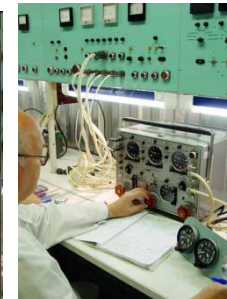
Leader – J. Legenzov,
AB "Helisota"



Aircraft Maintenance Technologies






Leader – J. Legenzov,
AB “Helisota”

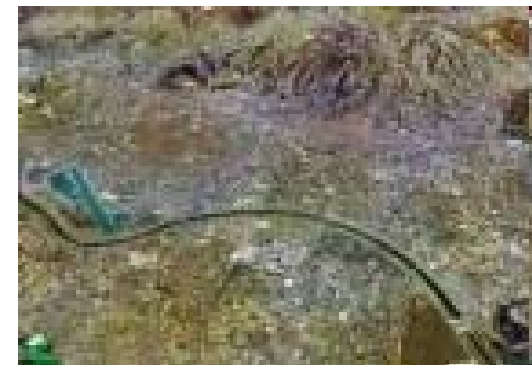
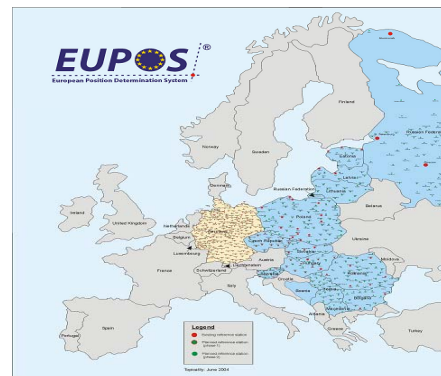
- ✂ Upgrade and modification
- ✂ Experimental production of composite airplanes
- ✂ Technical maintenance, repair and overhaul:
 - “Boeing 737-200”, “Boeing 737-300”, “Boeing 737-400”, “Boeing 737-500” Line and Base maintenance up to and including D-check, avionics system modification, structure repair;
 - “Saab-2000” Line and Base maintenance including 8 year inspection, avionics system modification, structure repair;
 - “Saab 340A/B” Line and Base maintenance including 4 year inspection, avionics system modification, structure repair.
 - Technical maintenance, repair, upgrade, modification and overhaul for “MI-8” and “MI-17” helicopters.



Geodesic and Cartographic Technologies

Leader- Prof. A. Zakarevicius
Vilnius Gediminas' Technical University

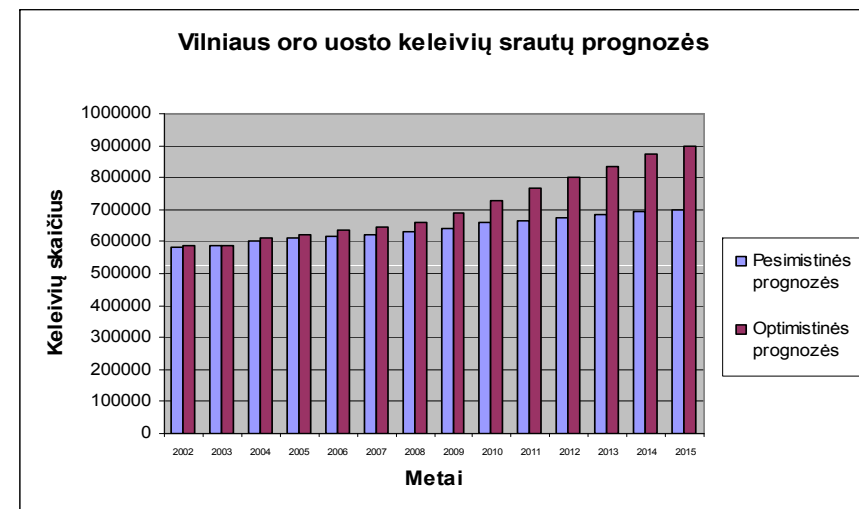
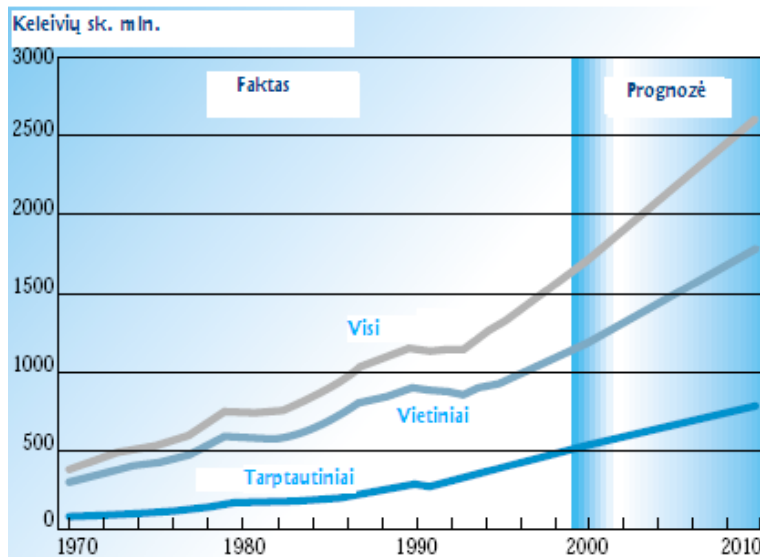
-  Development of satellite geodesy technologies for navigation purposes.
-  Development of an accredited laboratory for EDM calibration.
-  Establishment of GPS instruments calibration base.
-  Creation of data base of airport cartographic and navigation data and digital mapping with GIS technologies.
-  Optimization of the compatibility of navigation maps legends and improvement of mapping by applying GIS technologies.



The Strategic Research of Air Transport Development

Leader - K. Auryla
Civil Aviation Administration

- ✎ Strategic research of the development of air transport infrastructure and human resources
- ✎ Arrangement of the strategy for new air traffic control conceptions





Aviation Specialist Training

Leader - Prof. J. Stankunas
Vilnius Gediminas' Technical University

Integrated studies

- Aircraft Piloting
- Air Traffic Control

Bachelor degree studies

- Aviation Mechanics
- Electronics Engineering
- Aviation Electrical Equipment
- Aviation Mechanics
- Avionics



Master degree studies

Doctoral studies

- Transport Engineering
- Measurement Engineering
- Mechanics Engineering

Aviation specialists' qualification improvement courses



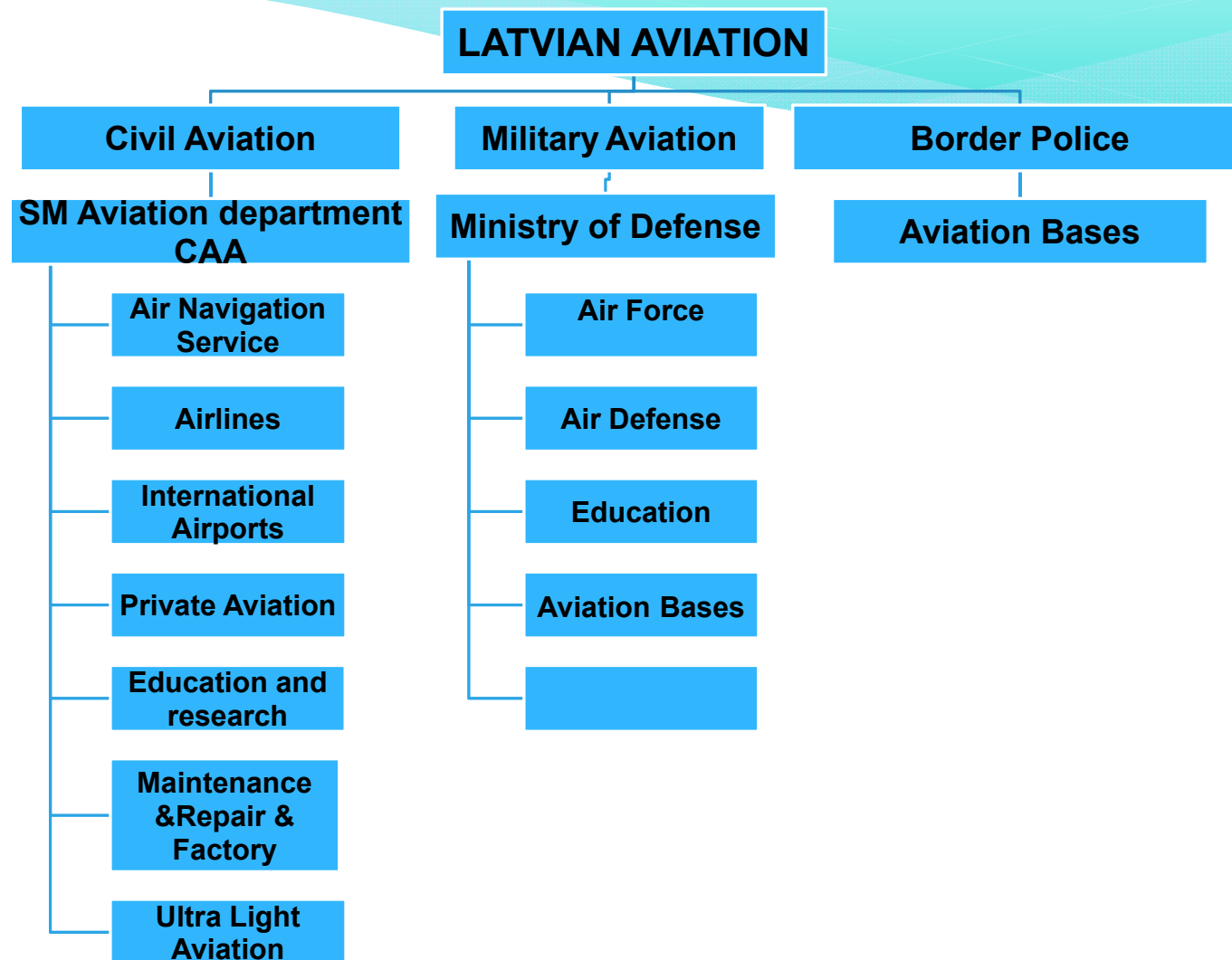


Aviācijas institūts



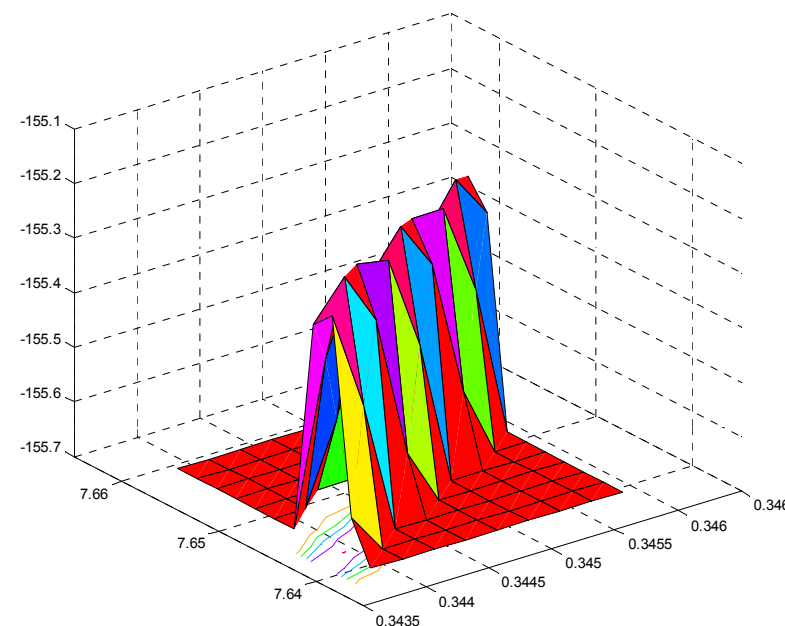
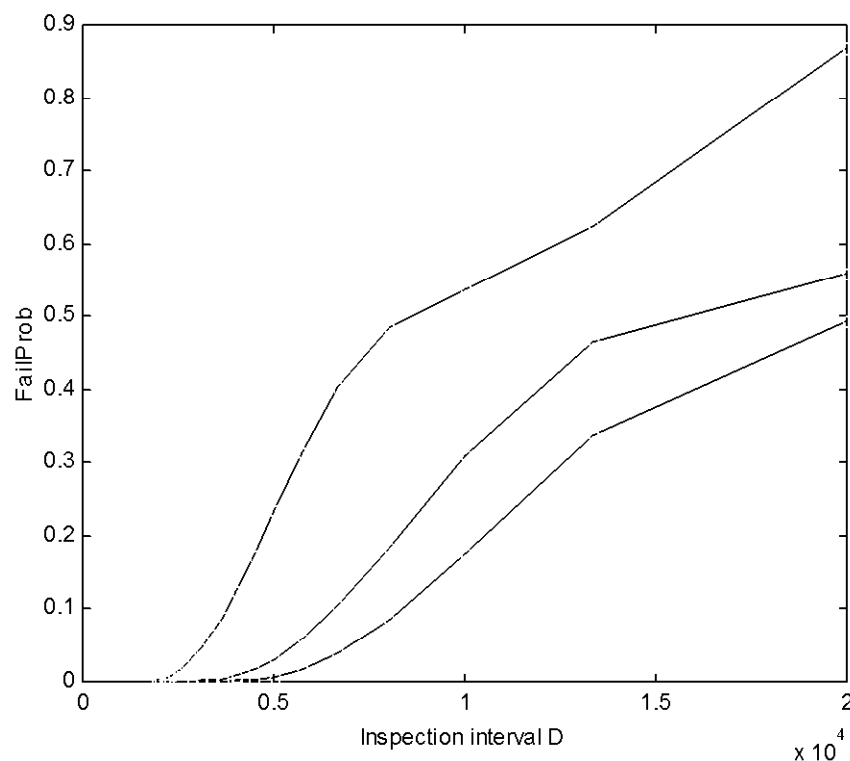
THE AVIATION SYSTEM in LATVIA

M. Kleinhofs AI, RTU





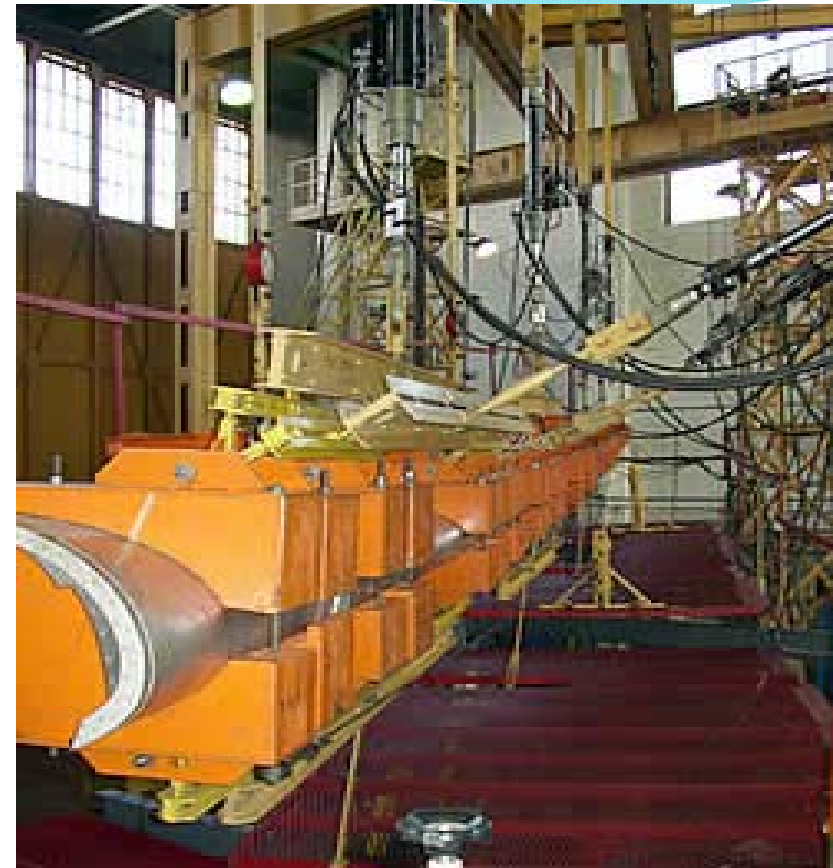
Reliability of aviation constructions



- Optimization of aircraft construction strenght
- Modeling of strenght of composite materials

preparing tensomeasuring

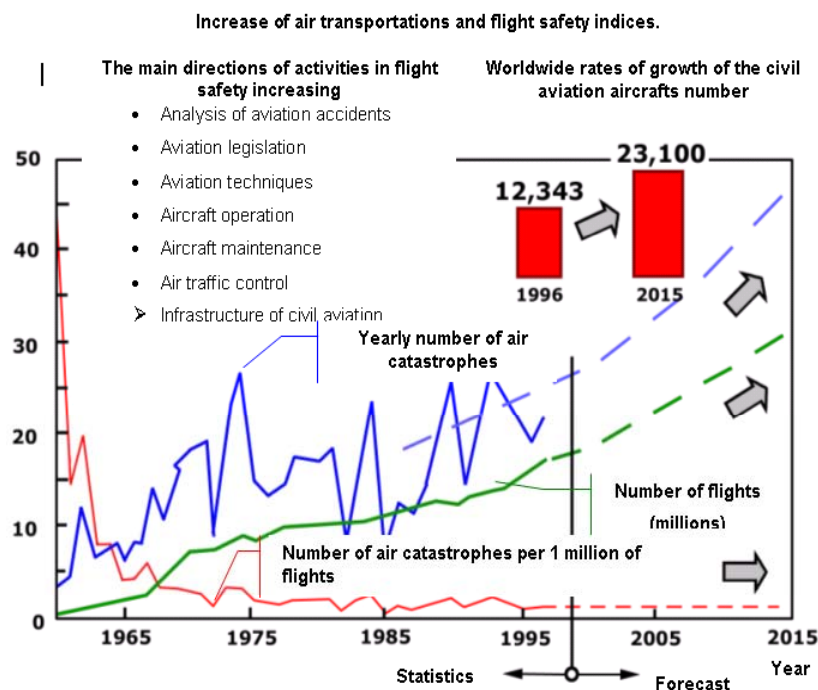
slats load systems





Aviācijas institūts: zinātnes virzieni

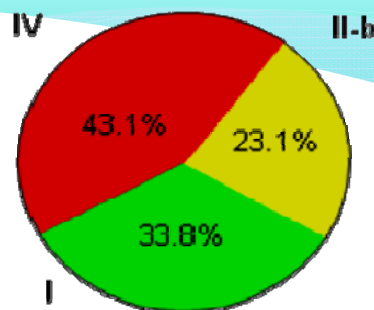
Aircraft maintenance optimisation process





Prof.V.Šestakovs

Forecasting emergency flight situations
under complex conditions



Lidojuma drošības iespēju sadalījuma spektra diagramma

EF		φ1"uzdotsais sānu virsma leņķis, grādi"													
		-45	-35,5	-30	-22,5	-15	-7,5	0	7,5	15	22,5	30	37,5	45	
φ1"uzdotsais trajektorijas līkuma leņķis, grādi"	20														
	18														
	16														
	14														
	12														
	10														
	8														
	6														
	4														
	2														

Lidojuma drošības logs



Latvia

Aviācijas institūts: zinātnes virzieni

Avionics system control



- Elektronisks aprīkojums
- Automātiskās vadības un navigācijas sistēmas



Aircraft aerodynamics, strenght and durability

- Aerodinamika un stiprības eksperimentālās metodes
- CAD/CAE tehnoloģijas
- Konstrukcijas tehniska stāvokļa kontroles integrētās sistēmas
- Kompozītmateriālu stiprības modelēšana
- Bezpilota lidaparātu problēmas



Latvia

Aviācijas institūts: zinātnes projekti

Integrated evaluation system of aircraft technical condition

SEVENTH FRAMEWORK PROGRAMME
AIRCRAFT INTEGRATED STRUCTURAL HEALTH ASSESSMENT II



Sensors location in a zone between
7th and 8th frames (inner view)





Aviācijas institūts: zinātnes projekti



SEVENTH FRAMEWORK PROGRAMME AIRCRAFT INTEGRATED STRUCTURAL HEALTH ASSESSMENT II

Partners of AISHA II:

1.	Katholieke Universiteit Leuven "Coordinator"	Leuven, Belgium
2.	MetaLogic N.V./A.I. Technologies & Engineering	Leuven, Belgium
3.	Deutsches Gesellschaft für Luft und Raumfahrt E.V.	Braunschweig, Germany
4.	Cedrat Technologies SA	Grenoble, France
5.	Eurocopter S.A.S.	Marseille, France
6.	Riga Technical University	Riga, Latvia
7.	Fundacion Centro de Tecnologias Aeronauticas	Vitoria, Spain
8.	Ferroparm (InSensor A/S)	Holsenborg, Denmark
9.	ASCO Industries N.V.	Brussels, Belgium
10.	Fraunhofer Gesellschaft zur Förderung der angewandten Forschung E.V.	Bremen, Germany
11.	Universität Leipzig	Leipzig, Germany
12.	Vrije Universiteit Brussel	Brussels, Belgium
13.	Universidad del Pais Vasco/ Euskal Herriko Unibertsitatea	Bilbao, Spain
14.	Lufthansa Technik AG	Frankfurt, Germany



Latvia

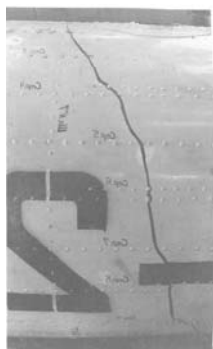
Aviācijas institūts: zinātnes projekti

Ultralight vehicle and its technology

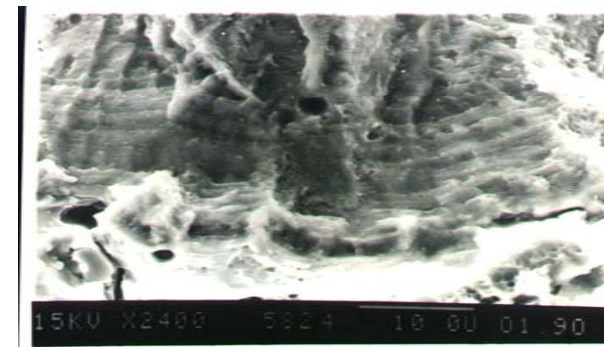
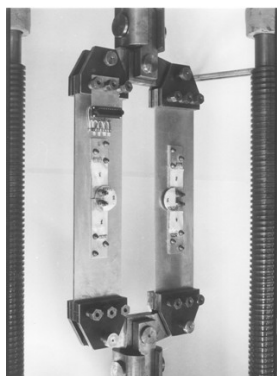




Aviācijas institūts: zinātnes projekti



Fatigue strength of helicopters Mi-8. 1985-1990. This project was made for Moscow Helicopter Plant (Design Bureau of M. Mil, Russia).



GFD photo of the fracture surface (x2400)

Fatigue cracks research method in aviation frames in operation conditions. 1989-1991. This project made for Kiev Mechanical Plant (Aircraft Design Bureau of O. Antonov, Ukraine).



Estonian Aviation Academy with partners

Research activities related with Clean Sky:

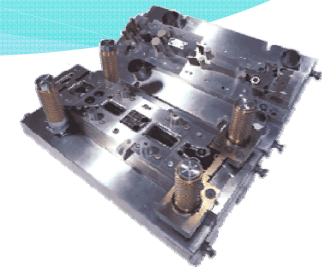
- Development of Air Transportation Forecast Models
- Human Factor and System Safety in Aviation
- The Effect of Aviation Activities on the Environmental Situation in Estonia
- UAV and Air Traffic Control: Procedures and Technical Problems
- Electromagnetic Compatibility in Aviation



Eesti Lennuakadeemia
Estonian Aviation Academy

Estonian R&D Areas with Potential to Contribute to Clean Sky

- Design and production of antennas
- Machined high precision metal components
- Products for wireless communication
- Development of environmental monitoring techniques
- Digital maps and positioning
- Spectral analysis systems
- Signal processing and coding
- Design and manufacturing of electronic appliances
- etc



Enterprises – Examples of Success

Laser Diagnostic Instruments AS (LDI)

Differential Optical Absorption Spectroscopy for open-path atmospheric monitoring and real-time analysis of gaseous atmospheric contamination

(FP7 DELICAT project)



IB Krates OÜ

Development of Code Generator for Safety Critical Embedded Systems (cooperation with Airbus France, EADS Astrium, Thales Alenia Space etc)



Conclusions

- ✈ The Baltic states have a sufficiently developed scientific and manufacturing potential for implementing aeronautical projects and participate in the Clean Sky Programme.

Thank you for your attention