



**A REVIEW OF POLISH AERONAUTICAL FATIGUE  
AND STRUCTURAL INTEGRITY INVESTIGATIONS**

**DURING MAY 2019 TO APRIL 2023**

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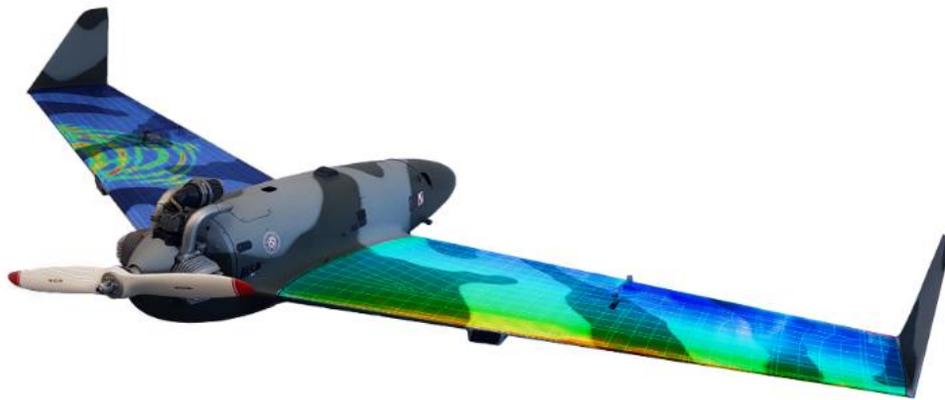
ICAF 2023, DELFT, NL, 26 – 29 June 2023

## INVESTIGATIONS IN MILITARY AVIATION

1. Service Life Extension Program of the Mi-24 Helicopter
2. SHM Application to Remotely Piloted Aircraft Systems – SAMAS Project
3. Structural Health and Ballistic Impact Monitoring and Prognosis on a Military Helicopter – SAMAS2 Project
4. MiG-29 Composite Bonded Repair Building Block Approach
5. Corrosion Health Monitoring System (CHMS)



*Mi-24 helicopter installed on the test rig*



*Digital visualization of SHM system data on UAV structure*



*Location of corrosion sensors on the airframe of the Mi-24 helicopter*

## 1. Joints

- Investigation into the Effect of RFSSW Parameters on Tensile Shear Fracture Load of 7075-T6

Alclad Aluminium Alloy Joints (*Rzeszów University of Technology, ILOT, Technical University of Košice*)

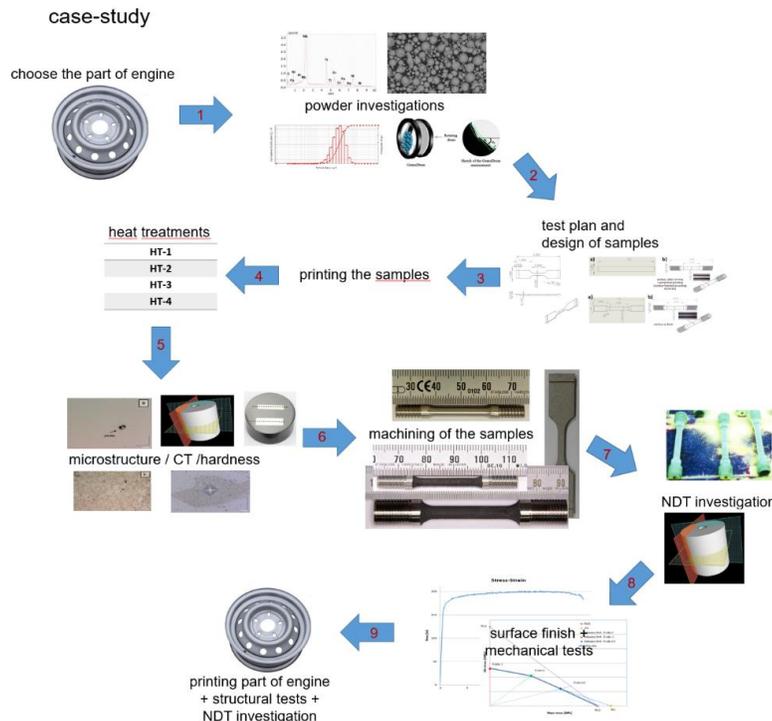
- Checking the Correctness of the Process of Brazing of the Honeycomb Seal to the Base by Ultrasonic Method

(*Calisia University*)

## 2. Additive Manufacturing

- Microstructural and Mechanical Properties of Selective Laser Melted Inconel 718 for Different Specimen Sizes

(*ILOT, Wrocław University of Technology*)



„ Development of an innovative technology for the production of geometrically complex, thin-walled aircraft engine components made of nickel-based alloys”

TECHMATSTRATEG Project No. 1/347514/NCBR/2017  
funded by Polish National Centre for Research and Development

## 2. Additive Manufacturing (cont.)

- Application of Laboratory Diffraction Methods in Characterization of Elements Made by Additive SLM Methods
  - State of the Art (*ILOT*)
- Laser Powder Bed Fusion and Selective Laser Melted Components Investigated with Highly Penetrating Radiation (*ILOT*)
- Laser Powder Bed Fusion (LPBF) of NiTi Alloy using Elemental Powders; the Influence of Remelting on Printability and Microstructure (*Warsaw University of Technology, Cardinal Stefan Wyszyński University, ILOT, University of Texas at El Paso, The Ohio State University*)
- Microstructure-Electrochemical Behavior Relationship in Post Processed AISI316L Stainless Steel Parts Fabricated by Laser Powder Bed Fusion.
- The Effect of Surface Treatment and Orientation on Fatigue Crack Growth Rate and Residual Stress Distribution of Wire Arc Additively Manufactured Low Carbon Steel Components (*University of Strathclyde, NTNU, ILL, ILOT, Australian Centre for Neutron Scattering, The University of Sydney, Cranfield University*)

# INVESTIGATIONS IN CIVIL AVIATION

## 3. Materials Tests

- Fatigue Life Evaluation and Prevention of Accelerated Degradation of Polymer Matrix Composites  
*(Silesian University of Technology)*
- Effect of Strain Range and Hold Time on High Temperature Fatigue Life of g17crmov5-10 CAST Alloy Steel *(Baker Hughes, Warsaw University of Technology, ILOT)*
- Unexpected Crystallographic Structure, Phase Transformation, and Hardening Behavior in the AlCoCrFeNiTi0.2 High-Entropy Alloy after High-Dose Nitrogen Ion Implantation *(IPPT-PAN, University of Science and Technology Beijing, ILOT)*

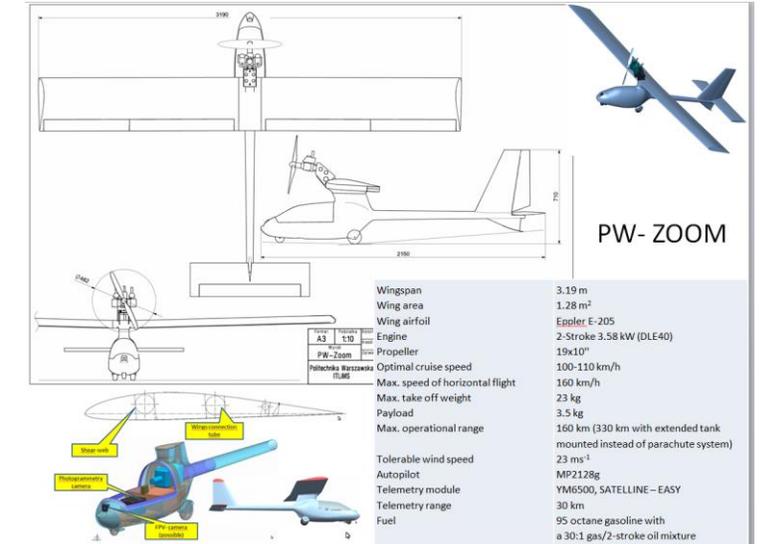
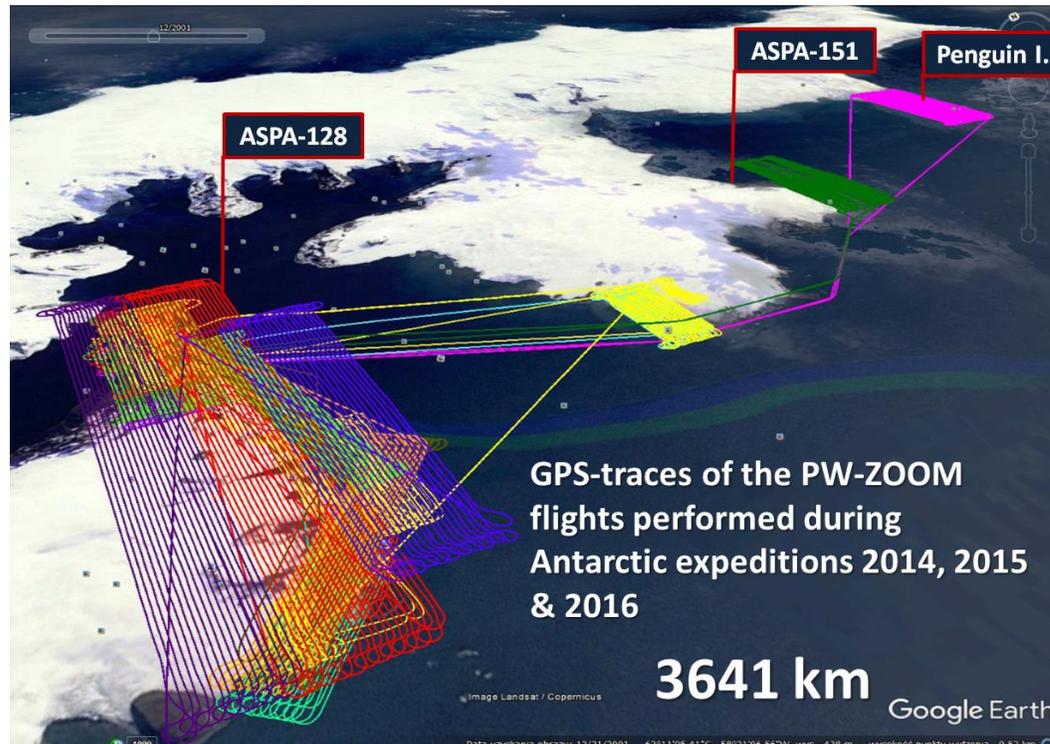
## 4. Other Works

- Direct Determination of Phase Stress Evolution in Duplex Steel using Synchrotron Diffraction (*ILOT, AGH-University of Science and Technology, LASMIS-ICD Université de Technologie de Troyes (UTT), Laboratoire Procédés et Ingénierie en Mécanique et Matériaux*)
- Experimental and Numerical Stress State Assessment in Reaill Friction Stir Spot Welding Joints (*ILOT, Rzeszów University of Technology*)
- Enhancement of NDE Techniques by Application of Advanced Signal and Image Processing Methods (*Silesian University of Technology*)
- Works Concerning Fatigue Aspects Performed Under the MONICA Project (*Warsaw University of Technology*)

# INVESTIGATIONS IN CIVIL AVIATION

MONICA - is the acronym of the Polish-Norwegian project entitled:  
"Novel Approach to Monitoring of Impact of Climate Change on Antarctic Ecosystems"

Polish Academy of Sciences  
Warsaw University of Technology  
Northern Research Institute NORUT, Tromsø



*The PW-ZOOM – the plane used in fotogrammetry missions in Antarctica*

*Photogrammetric flights of the PW-ZOOM over King George Island*

# Aerospace TESTING INTERNATIONAL

MARCH 2023

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### ELECTRIC PROPULSION

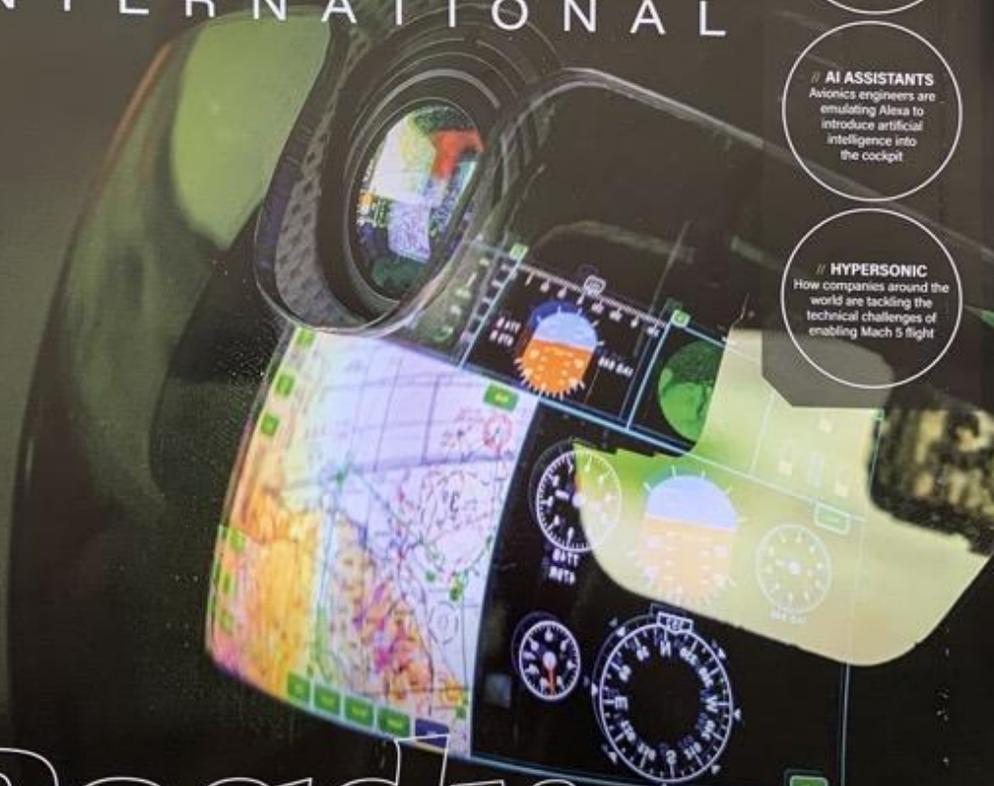
Special focus on electric motors, batteries and powertrain technology

### AI ASSISTANTS

Avionics engineers are emulating Alexa to introduce artificial intelligence into the cockpit

### HYPERSONIC

How companies around the world are tackling the technical challenges of enabling Mach 5 flight



# Ready for action

Engineers are combining digital and experimental techniques to certify the latest fighter pilot helmets

# NO TESTING, NO PROGRESS.



Thank you for your attention

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