SAFIBRA

Solutions, When the Conventional Ones Run Out of Breath

CASE STUDY
ADVANCED FLYING LABORATORY

Aircraft Condition Monitoring System

ABOUT OUR CLIENT

Client:
joint research/university and private companies

Location:
Czech Republic

Industry:
R&D, Industry, Transportation

The project's goal was the development of an aircraft condition monitoring system enabling the assessment of the aircraft's structural condition, especially after a harsh landing or flight through heavy turbulence. The system should feature increased mobility, robustness, small dimensions, and minimal power consumption. It should increase safety and reduce the number of accidents.

Another project's challenge was the development of new FBG strain sensors for embedding directly into the composite structure and joints. Their primary function was monitoring the entire process of aircraft construction, including assembly, curing, and final monitoring during its operation.

- New FBG based sensors designed for embedding directly into the composite structures and joints.
- Development of a new monitoring system featuring increased mobility, robustness, small dimensions, and minimal power consumption.

20+ YEARS

KEY FACTS

Initial state

- many aircraft's spaces and parameters are not being measured
- the monitoring deflection of all controlled surfaces is missing
- available monitoring systems too big or lacking the functionality

Products and technologies used

- FBGuard 1550 FAST MINI
- Composite sensor
- Signal Processor

SOLUTION

The project began with detailed research of fiber optic sensors and methods of their incorporation into composite materials with respect to technological procedures applied in aircraft construction. As a result, the Phoenix Air U-15 AFL, Advanced Flying Laboratory, based on an all-composite S-LSA motor glider, was developed.

Its construction, design, and final production involved a number of parts being equipped with FBG sensors, especially the empennage's vertical stabilizer with surface- mounted strain sensors and the empennage's horizontal stabilizer with sensors embedded inside the adhesive joints of the main spar. Furthermore, the structural parts of both wings had almost 90 strain sensors inside the adhesive joints of spars and web together with surface mounted temperature sensors.

1
opto-electrical aircraft condition monitoring system

100+
strain sensors inside the composite structures

16
flight parameters measured during the aircraft operation

PROJECT RESULTS

We have provided the customer with valuable real time information on the actual state of the aircraft's technical life. During the aircraft operation, 16 flight parameters (flight speed and altitude, engine speed, load multiples, control surface deflections, etc.) were measured and synchronized to strain measurements using the multichannel optoelectronic measurement system FBGuard Mini. This system had special features enabling unique optical and electrical sensor measurements.

In addition, we have verified that the deployment of optical fiber sensors does not significantly affect static strength and durability of tested structures. The project was supported by the Czech Technology Agency under the project No. TA04031450.

1.
Complex monitoring of composite parts

2.
Monitoring the entire process of assembly, curing and operational life

3.
Assessment of the aircraft's structural condition after harsh landing, etc.

PROJECT PARTNERS

PHOENIX AIR

FACULTY OF MECHANICAL ENGINEERING CTU IN PRAGUE

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GET IN TOUCH WITH US

and we will recommend the most suitable solution for your project.

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20+ YEARS