Bachelor-/Masterthesis/FP

Technische Universität München

EI
MST

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Lehrstuhl für
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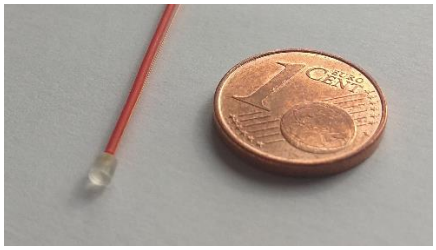
Research & Design on a fiber optic pressure sensor for aircraft applications

Civil aviation demands more powerful turbines with larger fan diameter to increase efficiency of large aircrafts. With increasing nacelle size, integration of those high and ultrahigh bypass ratio turbines on today's airframes is becoming more challenging as one needs to ensure enough clearance between nacelle and the runway. To prevent having to use larger and heavier landing gear, turbines are not mounted directly under the wings but coupled closer to the front of the wing. In critical flight situations, the updated nacelle position is degrading the aerodynamics and measurement of the local dynamic flow separation, complex flows and lift coefficients of real sized aircrafts are required to gain a better understanding of the prevalent aerodynamic effects. Conventional electrical pressure sensors show a degradation of their high performance in harsh environments during in-flight applications because of their low overload protection and susceptibility to electromagnetic influences. Fiber optic sensors promise the advantage of operating in those conditions, including humidity, water, overpressure, electro-magnetic noise, lightning and environmental impact such as heavy rain.



Within the scope of a research project, fos4X, a former spin-off of the TUM MST is developing a miniature airworthy passive fiber optic Fabry–Pérot pressure sensor, capable of surviving even in harshest environments. In combination with an industrialized low-cost and reliable edge-filtering interrogator, a flight-ready, fiber-optic measurement system with low noise, high dynamic range and high bandwidth is to design, measuring aerostatic, aerodynamic, and aeroacoustic events as a pressure sensor and as a microphone at the same time. The measurement systems will be tested in wind tunnels, on a microlight aircraft and finally on an Airbus A320.

The proposed scientific work is involving the sensor development, characterization and evaluation of Fabry-Perot sensor filter in combination with edge-filter interrogator. It includes analysis of the state-of the art, optimization and practical lab activities at the company fos4X, Munich. Experience with fiber optics is an advantage but not mandatory. The work also offers a good balance between theory and practical development.