PROJECT EXAMPLE: "FATIGUE RISK" – SMART SENSOR NETWORK FOR VIGILANCE ANALYSIS OF PILOTS ON LONG-DISTANCE FLIGHTS

Starting situation

A survey carried out by the European Cockpit Association (ECA) on 6,000 European pilots showed that more than one third of the pilots had fallen asleep in the cockpit due to exhaustion. If one considers that 70-80% of the pilots would not file a fatigue report or declare to be unfit to fly for fear of disciplinary action, the figures show the necessity of objectivising the subjective procedures. In the commercial aviation sector the legislator demands a "Fatigue Risk Management" system to assess the vigilance of pilots. The use of conventional measurement technology is neither economically feasible nor practicable due to the restrictions it would put on pilots' movements and the necessity of accompanying medical personnel.

Solution

A smart sensor network for sleep and vigilance analysis of pilots on long-distance flights was developed in collaboration with the partners SIGMA Medizin-Technik GmbH, DeMeTec GmbH and Cargolux Airlines International SA within the framework of the project "Fatigue Risk" (BMWI, FKZ KF2267414GM2) and evaluated under realistic conditions. By registering tiredness-relevant parameters it is possible to make an objective assessment of the pilots' vigilance. As vigilance can have a decisive influence on performance, vigilance monitoring is very important and can make a major contribution towards increasing flight safety. The wireless sensor network developed for this purpose at the Fraunhofer IBMT is made up of three sensor nodes to register activity as well as the vital and environmental parameters. The data are transmitted wirelessly on a time-synchronized basis to a master (e. g. tablet)

which carries out the processing, analysis, representation and storage, and can trigger an intervention, e.g. a wake-up alarm. The transmission takes place in conformance with the Bluetooth Low Energy (BLE) standard.

Potential

The system for monitoring and evaluation of vigilance in the cockpit is unrivalled as there is no comparable product on the market. Falling asleep in the cockpit can lead to fatal accidents. Monitoring and early reporting of such changes in alertness can help to avoid accidents and the related consequences. Up to now there is no simple and reliable system available for this. The sensor network infrastructure presented can also be adapted for other applications. This includes Ambient Assisted Living, the Home Care sector as well as man-machine interaction. The aim will be to provide a completely non-reactive monitoring system with reliable interpretation of the signals and high usability in long-distance operation.

Contact

Dipl.-Ing. Roman Ruff
Telephone: +49 (0) 6894/980-176
roman.ruff@ibmt.fraunhofer.de

1 *Evaluation of the measurement system for the monitoring and evaluation of vigilance of pilots in the cockpit.*

2 *Measurements on the manoeuvring area to assess the stability of the wireless connection in the sensor network under realistic conditions.*