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Engine Special

New designs for the future

Engine manufacturers are working under intense pressure on technological solutions which are set to satisfy the airlines' demands for steep cuts in the levels of fuel consumption and pollutant emission seen in present-day models.
Fiber optics for added on-board security

Sophisticated on-board entertainment systems also make challenging new demands on technology and call for secure and efficient channels of data communication. Indeed, constant increases in system complexity and the growth in information management resources are causing a sharp increase in data transfer. This goes hand in hand with an increasing number of cables in airplanes. The answer is optical fiber.

Flying has never been as enjoyable and convenient as it is today. Well-heeled passengers flying with Qatar Airways are greeted in Doha in the airline's own terminal, complete with marble finish, waterfall and concierge service. First-class passengers on Emirates Airlines are allocated mini-suites partitioned off for maximum privacy and offering every conceivable comfort, such as seven-course set menus and Givenchy pajamas.

Airlines are coming up with new ideas all the time in a bid to outdo their competitors and recruit passengers. There are more ways to get ahead of the rivals than by merely offering more legroom or a better wine selection. Entertainment and technical equipment have become a major selling point for airlines. So-called in-flight entertainment (IFE) is big business. Customers now expect films on long-haul flights as part of the standard service. The latest thing is seeing who can score the most points with state-of-the-art infotainment systems. Internet, video-on-demand and games consoles are all likely to make flights more enjoyable for passengers.

Airlines in the USA, the world's largest aviation market, are anticipating that the Internet will be the main trend of the future. Several airlines have already started running trials on domestic flights. JetBlue Airways, for example, has been offering a free email and instant messaging service since December. Another future trend besides Internet access is the facility for passengers to use their own electronic gadgets on board such as iPods. After all, some two thirds of all passengers own at least one electronic device like a laptop, MP3 player or a mobile telephone with extra functions. The investment would appear to pay
off with Air Canada bookings reportedly up by ten percent on flights with the latest IFE systems, according to Welt Online. On-board entertainment systems also make challenging new demands on technology, however, and call for secure and efficient channels of data communication. Indeed, constant increases in system complexity and the growth in information management resources are causing a sharp increase in data transfer. All this is going hand in hand with an increasing number of cables in airplanes.

**Electric pulses can cause sparks**

Conventional copper cables reach their limits when it comes to on-board data transmission. They transmit data in the form of electric pulses, which can pose something of a security risk. As the protective sheathing on a copper cable grows old or if it is damaged, it can result in sparks flying between the exposed copper wires. The risk is considerable and is increasing throughout the world. Various studies conducted in the USA by experts from the US air accident investigation authority, the National Transportation Safety Board (NTSB), have shown that even brand-new machines frequently fly with damaged cables. In a growing number of instances, therefore, cable faults are causing fires on board and not only on older types of airplane.

The use of optical fibers offers more security in that transmission is via light-induced pulses. Light is the fastest and most efficient medium of data transfer. A light-induced pulse takes just 1.3 seconds to travel from the earth to the moon. An optical system, a glass fiber, is required to be able to transport light-induced pulses. The data transmission is based on the principle of total reflection between the fiber glass core and the cladding: if a beam of light is routed into the optically denser core below a certain angle, the ensuing reflection of the beam is virtually loss-free at the transition to the cladding with the lower refractive index and it is therefore conducted. Fiber optic links transmit light rather than electric pulses thus completely eliminating the risk of flying sparks.

**Chemical and thermal resistance**

Fiber optic cables also boast minimal susceptibility to aging and outstanding chemical and thermal resistance. Wherever data transmission is required they can take much of the strain off conventional copper cables - while offering the facility of transporting much larger volumes of data. Glass fibers transmit signals on a higher bandwidth hence their ability to transfer more data at a time.

"Glass fibers offer clear advantages over conventional cables in applications requiring high levels of flame resistance and thermal stability as well as high transfer rates", commented Gerhard Zwickel, Aviation Manager at Schott AG. The Mainz-based international technology concern has developed fiber optic solutions specifically for use in aircraft. Multicore optical fiber developed by Schott can withstand temperatures of up to 125 °C, for example, and conforms to all relevant standards. "When we developed the product we had the benefit of extensive background research and experience in using fiber optics in automotive engineering", explained the Schott manager.

There is one further factor of great relevance for air traffic which militates in favor of the use of glass fibers: the weight. Glass fibers are much lighter than copper cables. With regard to installation, glass fiber connections are very flexible, having an extremely low bend radius of under five millimeters. Unlike other glass fiber solutions, each link at Schott consists of 280 to 320 individual fibers. Even if they are damaged the redundancy is extremely high, which largely precludes faults. This means there is no need to provide elaborate mechanical protection for the links, thereby translating as weight savings. Connections and links in fiber optics do not require any complex resources and are no problem over long distances either thanks to optical amplifiers.

Experts assume that a large proportion of new aircraft will be fitted with fiber optic cables by 2013. This will be conducive to fast and secure data transmission and will help make flights even more pleasant and comfortable for passengers with individual entertainment programs.

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