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Automation and energy saving in aviation transport

Mobility is fundamental to human activities in the modern society. In a globalized and interconnected world, the need for mobility will only increase. But only transport may provide high mobility and fast connection for people.

The transport sector is fundamental for the economy but also for personal life. With a growing population and the globalization process, it is not surprising that the demand of transport is set to grow in the near future. Nowadays air transport is the fastest type of transport in the world but there are exist many ways in which it may be developed. The main objective in aviation is to enhance mobility while at the same time reducing energy consumption. To reach this objective scientists develop new technologies. But only after tasting they introduce it a new models of planes or equip old models.

Today in the aircraft industry, aluminum is continuously substituted by composite materials. However, the aircraft structure has to withstand the electromagnetic environment it is exposed to. A series of research projects to develop techniques, which are intended to partially recover some of the beneficial properties of metallic structures, without too much weight and cost penalty are underway. Multifunctional materials and nanotechnology are considered key development areas for the use of composite materials in commercial aviation. The use of carbon nanotubes for improvement of electrical conductivity needs to be further pursued. Similarly, graphene technology shows a high potential for composite airframe improvements.

Improving the efficiency and performance of gas turbines is a very expensive effort needing long development periods. Improvements will require higher operating temperatures; therefore, research is focusing on materials resisting these severe conditions (an example is Tomo-Lithographic Molding manufacturing technology to produce improved airfoils). Fundamental material sciences should receive due attention.

Airplanes need a lot of electricity during operation. Onboard electricity generation is presently done by burning kerosene. Civil aviation airplane manufacturers are developing various solutions to generate onboard electricity more efficiently. Onboard H₂ production from jet-fuel to generate electricity is a possible way. By catalytic partial dehydrogenation of the fuel, hydrogen can be produced (Liew 2011) and then electricity can be generated with a higher efficiency thanks to fuel cell technology. The by-product of the dehydrogenation is still a very good fuel to be burned in the turbine.

The International Air Transport Association (IATA) has its own opinion about automation in aviation. Recommendation №17: IATA should engage with novel transport providers (hyperloop, drones, unmanned aircraft, space travel companies) to explore potential cooperation as well as shared needs. In a future

where passengers want to travel faster and prioritize convenience, seamless travel and connections between providers will become increasingly important. One option may be to widen IATA membership to include air transport operators who are not airlines.

The members of IATA also think that ‘Passenger drones’ or variants on personalized aircraft (for example with rooftop take-off) may have some impact, but a more substantial threat may come from the extension of an Uber-type algorithm based integrated transport system that links up small aircraft capacity at local airfields (possibly upgraded with ‘remote tower’ technology) to provide medium to long distance ground-air-ground travel options. Recommendation of IATA №18: Automation is expected to have a significant impact on transportation and logistics. To ensure that the airline industry benefits, IATA should establish a working group including both manned and unmanned aircraft operators to facilitate standard-setting and information sharing. Because Technology in self-driving cars may pave the way for more relaxed attitudes to automation. At the same time, there will be risks around the co-existence of piloted and pilotless flights in the same airspace (a risk already present with drones). Technology already enables pilotless flights. Freight shipment represents an opportunity for airlines to develop cutting-edge technology without watering down their commitment to passenger safety.

The emerging technologies that are reshaping the flying experience for the airline industry:

- Augmented Reality and Virtual Reality;

Industries like retail, healthcare etc. are seeing a lot of uses of the AR/VR revolution. Airlines industry is also following suit. Right now one of the most obvious applications of these technologies can be expected to be seen in the airport space where the airport experience can be enhanced with the help of AR/VR based apps. For e.g. The Gatwick airport uses AR to help passengers navigate the complex layout of the airport, and London City Airport has installed AR tech to help air traffic controllers with the vital job of keeping planes safe.

- Wearable technology;

Airlines have started to use wearable technology in various ways to do more than improving customer experience on flights. Some of the examples of airlines using wearable technology are: Recently Japan Airlines used Microsoft’s HoloLens for training its new crew members and engineers. Using HoloLens, the mechanics can be trained about engine mechanics akin to the experience they will have working on an actual plane. EasyJet and British Airways are among the airlines that have created apps for the Apple Watch, enabling passengers to store boarding passes and receive real-time updates on their wrist.

- Internet of Things.

According to the FTE: Over the course of the next decade, it is likely that all “things” on board will be connected and the health of everything, from engine performance to the IFE system, will be monitored in real-time. Sensors will automatically detect and report faults to maintenance teams on the ground, removing the need for the crew to manually report faults. Moreover, the addition of

sensors to aircraft seats will enable the crew to monitor individual passenger health and wellbeing, and to proactively respond to their needs. Virgin Airlines have implemented IoT in its Boeing 787. Every single element on the plane is attached to a wireless aeroplane network, providing real-time IoT data on elements like performance, maintenance etc. The airline is using the deluge of data that it is collecting through these flights to improve the efficiency of the aircraft and also being pro-active.

Conclusions

With development of technology human needs also increase. Thus, to satisfy needs the aviation industry try to improve and facilitate their services every day and also try to minimize pollutions.

Reference

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