Does Sustainable Flying Make Sense?

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Last year, I made a presentation about the reason why I entered KOSEN. It was to fulfill the promise I made with a friend of mine whose dream was to become a pilot. We played rugby together in the same team when we were elementary school students. He loved airplanes and was always talking about airplanes. We made a promise that he would become a pilot and I would build an airplane. When we were junior high school students, tragically, he came down with leukemia and passed away. I really need to realize the promise we made— I would make an airplane which he would fly. That is why I decided to study at KOSEN in order to become an engineer who develops airplanes. However, air flight does not seem to be a favorable way of transportation for the environment. Have you ever heard of the phrase "flight shame"? It is a movement started in 2017 with a newspaper piece written by five Swedish celebrities pledging to give up air travel for the sake of the environment, for airplanes emit a lot of carbon dioxide which is said to lead to global warming. The movement appeals for environmentally friendly transportation such as train travel. While flying is one of the fastest means of traveling for human-beings, that doesn't mean we can leave it to continue to emit a lot of carbon dioxide. Will airplanes become a product of the past, for they do not coexist with the environment? I don't think so. There must be some way. I believe combining next-generation biofuels and lightweight airplanes can make air travel sustainable.

Airplanes are indispensable for transporting things that require speed and control. Airplanes are used not only as passenger planes but also as freighters to transport something like medicines and chemicals for which temperature control is important or precision equipment such as semiconductor manufacturing parts that require transportation with minimized vibration and shock. On the other hand, the environmental destructions caused by airplanes is regarded as a problem globally. Among them, the amount of CO_2 emissions produced by the aviation industry accounts for more than 2% of the world's total emissions, which is about 600 million tons.

The development of next-generation biofuels is progressing so as to make airplanes a sustainable means of transportation. In 2018, human-beings succeeded in flying with next-generation biofuels made from non-edible biomass for the first time in the world. To give one example, ethanol can be produced from factory exhaust for fuel. It is estimated using next-generation biofuels can reduce carbon dioxide emissions by 70% in one flight compared to traditional flights consuming oil as fuel.

Reducing plane body weight is one way to cut fuel. The lighter airplanes become, the less fuel they consume to fly. In conventional airplanes, aluminum alloys are used for about 70% of the airframe. Being lighter and stronger than other metals, aluminum alloys are often used in aircraft. Still, aircraft is heavy. The weight can be further reduced by using Carbon Fiber Reinforced Plastic (CFRP). CFRP is 6 to 8 times stronger and 1.5 times lower in specific gravity than aluminum alloys. Boeing 787 uses

CFRP for 50% of its airframe. By reducing the weight of the airframe, fuel efficiency is improved by 20% and the amount of CO_2 emission is also cut by 20%.

Air travel is one of the greatest inventions by humankind which helps improve our life. However, that doesn't mean airplanes are allowed to keep emitting as much carbon dioxide as in the past. Therefore, I want to develop an eco-friendly lightweight airplane running on next-generation biofuels so as to make air travel as sustainable as possible.