

Team 3 Executive Summary – APS1012

With the reality that is climate change, the civil aviation industry is aware of the part it has played/is playing in rising earth temperatures and other environmental issues such as; noise pollution. Despite this fact, the industry is one of the most committed and most transparent in their efforts to either offset or reduce their emissions, no matter what form they take. The civil aviation industry is one of the fastest and most collaborative industries in the world, pioneers new innovations with no current practical use inspire engineers to keep creating to make the world a better place. An example; the folding wingtip on the upcoming 777x; this idea of a folding wingtip has existed on military jet fighters to save space on aircraft carriers for years, in 2020 they will be used to improve the efficiency and reduce the air pollution properties on the new 777x [1]. Boeing has said they've taken lessons learned from the Boeing 787, the first majority composite aircraft, and applied them to the 777x and the result is a wide-body long-haul plane with composite wings which helped in the increased wingspan, better fuel-efficiency and lower noise generation and air pollution [2].

As a whole, the industry is currently designing their planes to meet global goals set by the International Civil Aviation Organization (ICAO); 0% carbon emission by 2020 and a 50% reduction in greenhouse gas emissions by 2050 [3]. The case studies that will be presented will be examined from a perspective of achieving the goals set forth by ICAO.

As said earlier, the civil aviation industry is one of the most transparent industries when it comes to their display of new innovative technologies. The efforts examined in this report will be critique based on their practicality, their potential effects on the economy; will they lead to more automated jobs? Will they help in the goal set by ICAO? How soon can they be put into practical use, etc?

The research phase of this report was a rather easy process as these new efforts examined here were not hard to find due to the previously mentioned transparency of the industry.

The efforts examined here include the use of a combination of automated designed and 3D printed structures, the potential return of supersonic jets, use of composite in current planes and the future, and the idea of completely new form factors for better performance and sustainability.

A short overview of the in-depth analysis included in this report, and the expected impact they will have on the world;

- The use of computer designed structures and immediate manufacturing via 3D printing, what it means for current manufacturing, potential loss of employment.
- The advances in the use of composite materials in major structures in airplanes from the first introduction in the composite wing box of the Airbus A380 to its use in the Boeing 787 and the Airbus A350, potential future applications.
- The potential of completely new airplane form factors, the implications, potential advantages and disadvantages, and if they are worth exploring.
- The replacement of traditional jet fuel with biofuel in commercial transatlantic flights.

- The potential return of the supersonic jet, economic ramifications, potential lessons learned from the Concorde.
- The potential application of AI pilots on flights.

No shortage or limit of innovative technology was found and based on the findings, the industry just has to explore as many options as possible, which is already evident based on the past 5 years; the A350, the 737 MAX, the Bombardier C series, etc. The only recommendation that can be given to the civil aviation industry at this point is to not get complacent and keep researching new ways to improve and also to keep exploring the development of new form factors. New form factors, if they become a reality, will have a very large impact on the world, airports will have to be renovated or outright redesigned, the effect on passenger prices, destinations, etc., all these aspects will have to be examined.