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Developments In Aırcraft

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SUMMARY
This study examines both the growth and modernization of aircraft since the Wright brothers' first flight in 1903. Aircraft are used extensively for military purposes as well as for civilian purposes. Warplanes have developed and have acquired important features such as high maneuverability, advanced electronic systems, radar detection and payload capacity. Aviation is one of the most "Global" industries. It connects people, cultures and businesses across continents. Aviation has always been a high-tech industry and continuous progress in the development of new technologies is vital for the sustainable growth of the aviation industry.
Unmanned aerial vehicles, which emerged in the recent past and revealed that unmanned warplanes can undertake their future duties, are used by security forces for reconnaissance-surveillance and attack purposes today.
KEY WORDS: *Aircraft, productivity, Aviation, noise, polluting emissions*

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I. INTRODUCTION

Aviation has long been the focus of public attention for its environmental impacts such as noise, polluting emissions and, more recently, carbon dioxide (CO2) emissions. According to data provided by the Carbon Dioxide Information Analysis Center[1], it remained fairly constant at 2%. This is to reduce aviation emissions [2], global net aviation carbon emissions by 50% by 2050 compared to 2005. To achieve these goals, aviation stakeholders have adopted a multi-pronged strategy [3]. The following targets have been set to reduce fuel or energy consumption [4]. The Canadian aviation industry supports research and development projects in the areas of "clean, sustainable and quiet flight" [5]. An example of an operational goal supporting the implementation of new aircraft technologies relates to the plans to electrify aviation in Norway. It aims to carry out all short-haul flights with electric aircraft by 2040 [6]. As the main innovative features, the proposed design may include an oval body and a fuel-efficient shorter engine intake design [7].

II. DEVELOPMENT OF AİRCRAFT FROM PAST TO PRESENT

Efficiency is paramount in the aviation industry, one of the fastest growing global industries. Since the Wright brothers' first flight in 1903, air transport has been constantly growing and modernizing. Aviation has long been the focus of public attention for its environmental impacts such as noise, polluting emissions and, more recently, carbon dioxide (CO2) emissions.

Figure 1. Wright handbill, 1903 DH 106 Comet, 1959 Airbus A350-XWB-1000, 2018

During the 1920s and 1930s, the numerous innovative flying machines designed included several concepts that were supposed to provide vertical take-off capabilities. One of them was developed in the USA by Henry Berliner in the early 1920s (fig. 7).

Figure 2. McDonnell XV-1 compound helicopter(Boeing Fotoğraf AD98-0209-13).

III. FUTURE TECHNOLOGİES

The aircraft, which entered service in the next few years, have the same general configuration as their predecessors. However, they are equipped with retrofits, series upgrades and newly designed components and systems that enable them to have higher fuel efficiency performance.

3.1. Aerodynamic

Aerodynamic technology has been continually advancing over the past decades to produce new designs with significantly reduced drag. An aerodynamic technology that has been followed for many years and has recently made new advances in development is Laminar Flow Control. This technology significantly reduces drag by preventing turbulences in the airflow on the plane's surface.

IV. SMALL BWB CONCEPT

DZYNE Technologies, in collaboration with NASA, has developed a small BWB aircraft concept with a basic design capacity of 120 seats. Optimizing the layout for a smaller BWB was made possible thanks to a landing gear storage mechanism that required less height and allowed a flatter design of the entire aircraft [10], [11]. Within the framework of the small BWB concept, a T-shaped “plug” design has been proposed to obtain a series of aircraft models with passenger capacities ranging from 120 to 200, derived from a basic model [10].

Figure 3. NASA X-plane: Blended Wing Body by DZYNE

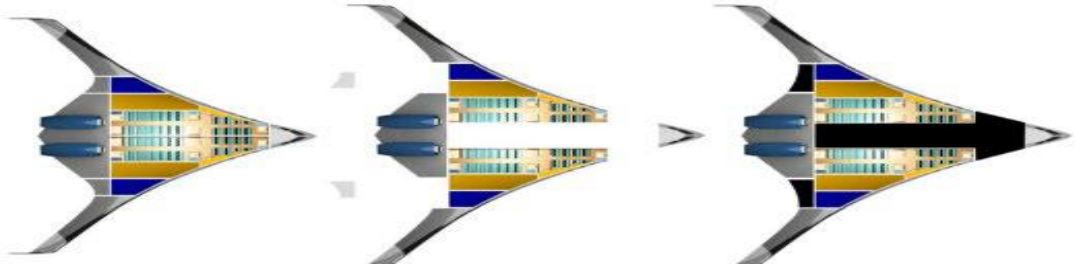

Figure 4. Insertion of a T-plug to increase the capacity of a BWB[10].

V. FLYİNG-V

Another promising flying wing concept that has received a lot of attention recently is the "Flying-V" [12], a V-shaped high-sweep biplane configuration designed for a similar passenger count (314) and range as the A350. The two wings house the passenger cabin, cargo hold and fuel tanks. It can use the same airport infrastructure with the same wingspan as the A350. Similar to the BWB configuration, the Flying-V has lower aerodynamic drag and is 20% more fuel efficient than a comparable tube and wing aircraft.

Figure 5. Flying-V aircraft concept developed by TU Delft in collaboration with KLM

VI. HYBRİD-ELECTRİC AİRCRAFT

Hybrid-electric aircraft are seen as a very effective alternative to conventional short- and medium-range aircraft in the near future. Many large companies in the aerospace and electrical equipment industries are investing in this technology, such as Airbus, Siemens, Rolls-Royce, Boeing and others. These aircraft are designed to replace conventional aircraft powered by combustion engines on regional routes. According to DLR studies, it will be entirely possible to replace 60% to 70% of all conventional regional aircraft with hybrid aircraft [13]. The long-term goal is to build a commercial aircraft equipped with E-Fan X technology, with a capacity of 50-100 passengers and capable of flying regional and short-haul routes, which is expected to enter service around 2035 [14]. [15].

Figure 6. E-Fan X Technology by Airbus

VII. BATTERY-POWERED AİRCRAFT

Battery-powered airplanes generally achieve the greatest possible CO2 emission reduction and environmental benefit. While today's electrical power generation produces roughly 0.6 kg CO2/kWh (on the world average [16]), progress in renewable energy development and States' commitments under the Paris

agreement (some States 80. To reduce CO2 emissions by 90% by 2050), CO2 from electricity emissions will be significantly lower in the coming decades.

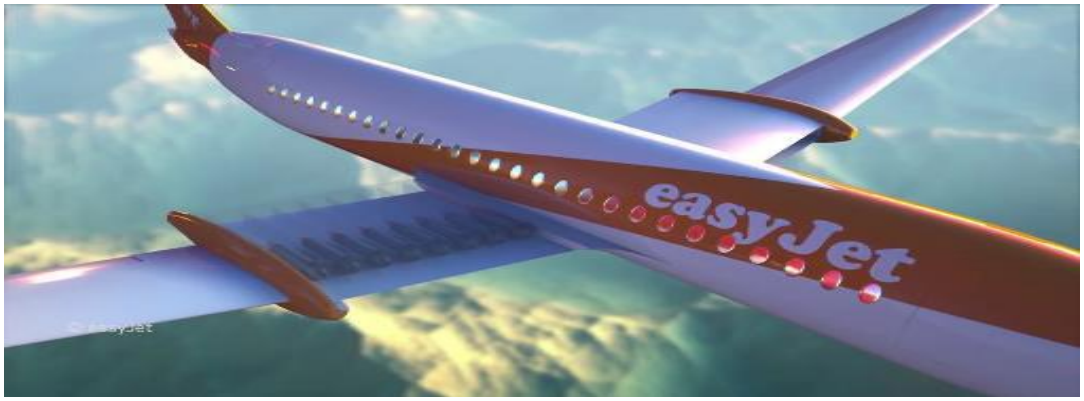

Figure 7. Wright Electric battery-powered airplane concept with distributed propulsion

VIII. Electric Blended Wing Body

NASA with distributed turboelectric propulsion systems over the past decade [17]. [18] predicts approximately 70% fuel savings.

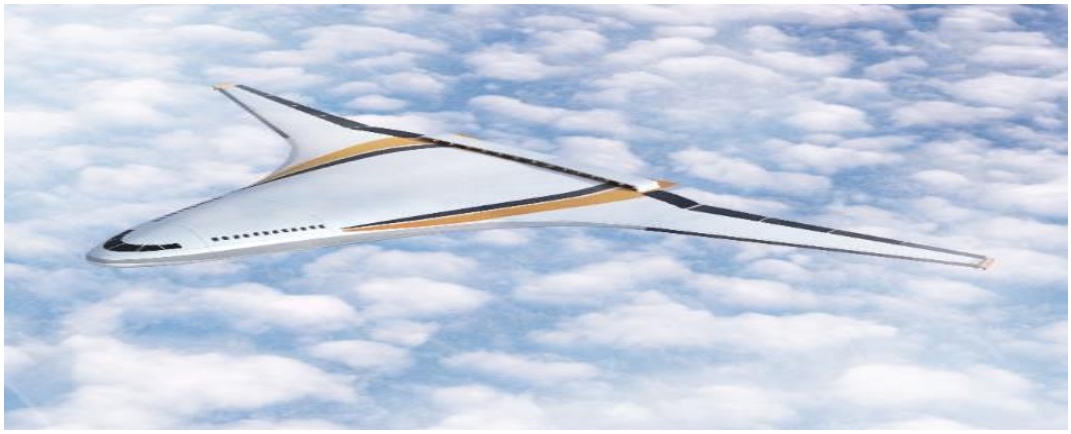

Figure 8 NASA Turboelectric Blended Wing Body

With progress in the development of renewable energy and States' commitments under the Paris agreement, CO2 emissions from electricity can be expected to be significantly lower in the coming decades.

IX. SUPERSONİC COMMERCİAL JET

Fuel consumption and associated costs are estimated to be approximately 30% lower than that of the Concorde. The environmental impact of supersonic aircraft is much higher than that of subsonic aircraft. In particular, supersonic flights are still very high in CO2 emissions. Also, the problem of reducing the sonic boom noise to a level where it is no longer disturbing on the ground is still not fully resolved. Therefore, flying at supersonic speed, especially with larger commercial aircraft, may be limited to segments of route over seas, as is the case today [19].

Figure 9. Supersonic Commercial Jet by Boom

X. RENEWABLE POWERED AİRCRAFT

Today, with the depletion of fossil fuels and the visible effects of the damage to the environment, it has made it necessary to use alternative energy more in every field. As a result, the construction of airplanes flying with solar energy has been accelerated.

NASA flew its first successful electrically powered airplane in 1995. The aircraft, called the Pathfinder, was an unmanned aerial vehicle. The aircraft managed to stay in the air for 12 hours with its 8 electric motors and 30 meters wingspan. Upon this result, NASA continued its aircraft projects. First, it increased the Pathfinder's wingspan to 37 meters and reached a height of 25,000 meters. Then the second solar-powered unmanned aerial vehicle called Helios was developed. Helios' goal was to reach 30,000 meters and fly 24 hours a day. Helios, which first flew in 1999, had a wingspan of 75 meters and was longer than the jumbo jet Boeing-747. The aircraft, which has 14 engines, reached an altitude of 29.5 kilometers in 2001.

Figure 10. NASA's Pathfinder unmanned aerial vehicle (IHA)

Figure 11. NASA's Helios unmanned aerial vehicle (IHA)

XI. CONCLUSION

The major armies of the world are making great efforts to develop manned and unmanned aerial vehicles in order to establish air dominance. While 21st century technologies are changing rapidly, aircraft are also affected by it. So much so that, before most of the fifth generation fighter aircraft projects reached the mature stage, sixth generation aircraft projects started to be prepared. A similar situation exists for unmanned aerial vehicles. New aircraft and technologies Aircraft and engine manufacturers and technology developers need to be actively involved in their evaluation under day-to-day operational conditions to ensure they meet users' requirements. Electric aircraft manufacturers and other technology innovators will enter the industry as new stakeholders. They will need to develop the same level of collaboration with other stakeholders in the industry, such as traditional manufacturers, to ensure that radically new aircraft are integrated into the future air transport system.

In the last 50 years, the increase in the efficiency of solar cells and their very thin design have enabled electricity and sun rays to enter every area where they exist. One of these areas is airplanes. In 1957, the first model airplane to fly with a solar cell was built and successfully flew.

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