1 Introduction

MTU Aero Engines AG (MTU) provides its services to sectors with very stringent regulatory obligations. PFAS are used for maintenance, repair, and overhaul (MRO) in the aerospace industry (civil and military). 30% of all aircraft have MTU technology on board. Importantly, for any modification, prior approval from the OEM is an absolute necessity. Indeed, their requirements are based on very strict industry standards for the aerospace industry to ensure passenger safety. The aerospace industry involves diverse fields such as navigation, engineering, development, and maintenance, serving both civil and military/defense sectors. The final products within this industry include aircraft, airships, helicopters, and other flying vehicles, along with related equipment, systems, and structures. Undoubtedly, it stands as a highly intricate and multifaceted sector, directly impacting the safety and well-being of EU citizens. The following sections explain the most important regulations in this sector. The lifecycles of an aircraft engine ranges from 25 to 50 years. More than 11,000 engine experts work at 17 locations. At the moment there are 300 technology projects, 2,675 patents and 700 inventors. The revenue is around € 5.3 billion the EBIT adj. € 655 million.

2 Supply chain and sectors involved

In the near future aircraft engines might be powered with hydrogen. To power those engines fuel cells will be needed. The flying fuel cell (FFC) is one of the most important technology projects to guarantee decarbonisation in aviation in the future. The membranes, gaskets and other parts in those fuel cells are made of PFAS. The products are purchased directly from retailers. There is no rework of the products done by MTU. PFAS membranes are only used during assembly and disassembly of the flying fuel cell.

3 Employment and economic information

Currently only the employees who work in the research and development department are in contact with those PFAS products. The products are in a closed loop and are therefore not in contact to the environment. No more useable products are collected and will be separately disposed. This means it will be incinerated in a hazardous waste incinerator. PFAS use in aircraft engines

4 PFAS use in aircraft engines

PFAS are used in the flying fuel cell, because of their high temperature and chemical resistance, their durability and mostly because of their semipermeability. Without those PFAS products it would be impossible to build up an aircraft engine driven by electricity. MTU is only purchasing products for final use and is not a manufacturer of those chemicals.

5 PFAS alternatives offered in the market, considering the technical suitability

The polymers in the market identified as a substitute are not suitable for the application in the aero engine market. Even if there is any product available it takes a lot of time of sorting it out. Various technology projects are currently running to substitute PFAS. Considering the average duration of comparable tests it will be almost impossible to substitute PFAS within 18 months. Nevertheless the final approval whether a substitute is useable or not is has to be given by the OEM manufacturer of the aircraft engine (e. g. GE, Pratt&Whitney) based in the Unites States. The decision making process takes a lot of time because carrying out admission tests and alternative testing in production under near-series conditions is necessary. Therefore it is not possible to estimate a timeline for transition to alternatives.

6 Potential impacts of the restriction

The flying fuel cell is one of the most important technology projects to guarantee decarbonisation in aviation in the future. Without the FFC electrical flying will be impossible. One of the main parts in the FFC are made of PFAS (membranes). So it is absolutely necessary to have PFAS products available for the FFC application. At this time no alternative membranes are available. A substitution of PFAS would postpone the introduction of electrical flying for more than ten years. A further delay would mean a miss of the decarbonisation goals. The FFC would not only reduce the carbon exhaust but also the amount of nitrogen oxide.