SUSTAINAIR TO PROVIDE FLIGHT PATH FOR GREEN DEAL TRANSITION

31 March, 2021 — Horizon 2020 project SUSTAINair was launched recently to research and develop solutions to increase resource efficiency and aircraft performance while cutting down on waste and material costs throughout the aircraft life cycle, what is known as circular aviation. The COVID-19 crisis has plunged the sector into uncertainty with many aircraft being taken out of service earlier than anticipated. Despite that, boosting the post-pandemic aviation industry´s green transition remains a strategic objective of governments providing a path to recovery.

This EU-funded research aims to make the entire aviation supply chain ecosystem greener in line with the Circular Economy Action Plan, setting new standards for aerospace manufacturing enabling an increase in cross-sector synergies. Based on the circular economy approach, SUSTAINair provides the aviation sector with a runway to a more cost-effective, low-carbon economy while tackling the increase in resource consumption, waste and emissions. Because of this, the SUSTAINair project has been endorsed by the Future Sky research initiative of the Association of European Research Establishments in Aeronautics (EREA).

European collaboration led by the Austrian Institute of Technology – AIT

Starting in January 2021 and spanning a period of 3.5 years with a budget of €5 million, the SUSTAINair project is a collaboration of 11 European research organisations and industrial partners. The project is co-ordinated by Jürgen Roither, research engineer at the Center for Low-Emission Transport at the Austrian Institute of Technology AIT-LKR, Austria's largest research and technology organisation.

Roither stressed the complementary function of each project partner within a particular circular economy stage of the aircraft lifecycle. "*SUSTAINair is addressing all phases of the aircraft component value chain from circular design to manufacturing, maintenance and repair, to assembly and recycling, and it will excel through the combined competence and expertise of its project partners,*" he said.

Roither added that material innovations in the highly regulated aviation sector need to be certified in order to fly, thus SUSTAINair was seeking advice from the European Union Aviation Safety Agency (EASA), which would be headed up by EASA Senior Research Co-ordinator, Willy Sigl.

"*The contributions of EASA shall reduce the time to market of new innovative products and business models and enable a high level of safety, security, and environmental protection. EASA therefore supports selected research projects, such as SUSTAINair, in an advisory role concerning certification, regulation, and safety assessment aspects*," Sigl commented.

Landing the buy-to-fly ratio

The circular economy is an approach to make the most out of resources by keeping them in use for as long as possible, thus increasing their total value throughout their life cycle. The aerospace demand for high-quality material is typically accompanied by large amounts of waste during the manufacturing process. This applies to both metal alloys and composites.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101006952

The novel up- and recycling methods developed within SUSTAINair for both metal and composite aviation materials, will contribute to a major reduction of waste incurred during the manufacturing and end-of-life processes. Upcycling solutions will be developed for carbon- and glass fibre thermoset materials, as well as high-performance thermoplastic composites.

SUSTAINair co-ordinator Roither added that the project aimed to develop near net-shape components (manufactured as close to the size and the shape of the finished product) for the aviation industry to reduce the buy-to-fly ratio close to 1, which is imperative if more material is utilised along the chain than is discarded. This is obtained by using recently invented nano-eutectic aluminium alloys at AIT-LKR in combination with advanced high pressure die casting technologies. "*Such processing is known in the automotive industry as 'quick and efficient'. SUSTAINair´s adapted technique and materials will make the manufacturing of aerospace components 'quick, efficient and clean'*," Roither said.

Novel aerospace structures to reduce weight, CO2 emissions

Novel metal alloys and composite materials, such as carbon fibre reinforced polymers, are used to reduce mass and increase aerodynamic efficiency, thus improving fuel consumption during flight operations, and therefore reducing emissions. Minor changes to the materials or to the aircraft structure can have major results when it comes to fuel consumption.

With that in mind, SUSTAINair will develop not only novel materials for a flexible wing, but also techniques for the integration of sensors in the material used in such aircraft components. For example, the monitoring of real-time data allows the operators to adjust the flightpath of an airplane resulting in lower fuel consumption, while increasing the safety and the reliability of aero-structures, as well as reducing maintenance costs.

Such a combination of metal and composite materials does not come without technological challenges to joining and repair operations, as well as for circular approaches in the end-of-life process. "*What is unique about SUSTAINair is that the design process will be formed to allow for innovative techniques along the value chain which will give the material a longer life with more value, accounting for end-of-life disassembly and upcycling*," said Chiara Bisagni, Professor in Aerospace Structures and AIAA Fellow, at TU Delft, Netherlands.

Disassembly robot to enhance recyclability

Aircraft consist of many parts from various materials that need to be joined. Currently the joining is done by using rivets, which are difficult to remove. This makes the separation, and thus efficient recycling, of aircraft components challenging and costly to the point of being not economically viable. Rivets also make aircraft heavier, negatively affecting fuel consumption. The particular expertise of project partners in welding and in other joining techniques could ultimately eliminate the need for rivets. This innovation cannot be adopted without changes to the current standards given by aviation authorities such as EASA.

Introducing Industry 4.0 technology in aircraft end-of-life processing, the SUSTAINair project will develop a robot head that automatically detects and removes rivets, allowing for alloy separation and hence higher value recycled aircraft material.

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On Flightpath 2050

The project partners are on the forefront of circular aviation pursuing objectives set by the EU Green Deal and Flightpath 2050. The technological innovations brought about by the transition to a circular economy can be seen as a pathway for tackling the economic effects of the Covid-19 pandemic in industries along the entire aviation component supply chain.

The partners of the project are: AIT-LKR Leichtmetallkompetenzzentrum Ranshofen GmbH (Austria), Netherlands Aerospace Centre – NLR (Netherlands), Deutsches Zentrum für Luft- und Raumfahrt e.V. – DLR (Germany), JOANNEUM RESEARCH (Austria), Johannes Kepler University Linz (Austria), Delft University of Technology (Netherlands), AEROCIRCULAR (Belgium), INOCON Technologie GmbH (Austria), INVENT GmbH (Germany), Dutch Thermoplastic Components B.V. (Netherlands), RTDS Association (Austria)

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Project website: www.sustainair.eu

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CORDIS: https://cordis.europa.eu/project/id/101006952

Background information

Circular Economy Action Plan

EU Green Deal

Flightpath 2050

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