



LUFTHANSA GROUP



Lufthansa Technik



Lufthansa Cargo

Joint news release

May 3, 2021

Nature as a role model: Lufthansa Group and BASF roll out sharkskin technology

- **From 2022, Lufthansa Cargo will equip all Boeing 777 freighters with AeroSHARK**
- **Innovative surface technology from Lufthansa Technik and BASF improves fuel efficiency and helps airlines to reach sustainability targets**

The lower the frictional resistance of an aircraft in the air, the lower the fuel consumption. Using nature as a role model, the aviation industry has been intensively researching ways to reduce aerodynamic drag for many years. Now Lufthansa Technik and BASF have succeeded in making the breakthrough as part of a joint project. AeroSHARK, a surface film that mimics the fine structure of a shark's skin, is to be rolled out on Lufthansa Cargo's entire freighter fleet from the beginning of 2022, making the aircraft more economical and reducing emissions.

The surface structure consisting of riblets measuring around 50 micrometers imitates the properties of sharkskin and therefore optimizes the aerodynamics on flow-related parts of the aircraft. This means that less fuel is needed overall. For Lufthansa Cargo's Boeing 777F freighters, Lufthansa Technik estimates a drag reduction of more than one percent. For the entire fleet of ten aircraft, this translates to annual savings of around 3,700 tons of kerosene and just under 11,700 tons of CO₂ emissions, which is the equivalent of 48 individual freight flights from Frankfurt to Shanghai.

"Responsibility for the environment and society is a key strategic topic for us," says Christina Foerster, Member of the Executive Board of Deutsche Lufthansa AG with

responsibility for sustainability. “We have always played a leading role in introducing environmentally friendly technologies. The new sharkskin technology for aircraft shows what strong and highly innovative partners can achieve collectively for the environment. This will help us to achieve our goal of climate neutrality by 2050.”

“The aviation industry is facing similar challenges to the chemical industry: ongoing progress must be made with climate protection despite high energy requirements. By collaborating closely and successfully combining our know-how in surface design and aerodynamics, we have now succeeded in taking a major step forward. This is an excellent example of sustainability in practice, achieved through partnership-based collaboration and innovative technologies,” says Dr. Markus Kamieth, Member of the Board of Executive Directors of BASF.

“We are proud that we will now be able to operate our entire freighter fleet even more efficiently in the future thanks to sharkskin technology and reduce the carbon footprint of our modern fleet further. The investments we have made in rolling out AeroSHARK at Lufthansa Cargo consciously reaffirm our commitment to the United Nation’s sustainable development goal on climate action,” explains Dorothea von Boxberg, Chief Executive Officer of Lufthansa Cargo AG.

In its cooperation with BASF, Lufthansa Technik is responsible for the material specification, approval by the aviation authorities and performance of aircraft modifications carried out as part of regular maintenance layovers. Backed by decades of experience as an approved aviation design organization, the company will obtain a Supplemental Type Certificate (STC) for the 777F from the European Union Aviation Safety Agency (EASA), which is required for operation.

“We have always used our wealth of expertise as a global market leader in technical aircraft services to also contribute to reducing the ecological footprint of our industry. In doing so, we can leverage significant savings potential from all aircraft generations,” explains Dr. Johannes Bussmann, Chief Executive Officer of Lufthansa Technik AG. “I am therefore very proud that we will soon be able to transfer the positive findings of the validation phase into the series application with Lufthansa Cargo. The extremely constructive collaboration with BASF is also the

best example of cross-sector cooperation in the interest of the sustainability of the aviation industry.”

The Coatings division of BASF is developing innovative, functional films in its Beyond Paint Solutions unit – such as the riblet surfaces, for example. A solution was implemented together with Lufthansa Technik which fulfills the strict requirements of the aviation industry. Exterior surfaces used in aviation are exposed to factors such as strong UV radiation as well as temperature and pressure fluctuations at high altitudes, among others. BASF has therefore focused its development on achieving extreme durability and weather resistance. The key criteria for use in aviation operation include simple application and handling as well as ease-of-repair, for which a custom concept has been developed.

“As an expert in surfaces, we implement bespoke solutions for our customers. The innovative sharkskin technology allows us to support Lufthansa in achieving its sustainability goals and in making the aviation industry a little more environmentally friendly,” says Dirk Bremm, head of BASF’s Coatings division and also responsible for functional films in this role.

The aviation industry has been researching the use of sharkskin for aircraft for many years, albeit often just on a small scale. For the first time at the end of 2019, Lufthansa Technik and BASF fitted almost the entire lower half of a Lufthansa Boeing 747-400's fuselage with 500 square meters of such a jointly developed sharkskin surface and had this modification certified by EASA. This aircraft (registration D-ABTK) subsequently validated the savings potential of the technology on scheduled long-haul services during more than 1,500 flight hours. This provided unequivocal proof that emissions were reduced by around 0.8% thanks to the sharkskin modification. The savings for the Boeing 777F are estimated to be even higher, because the application areas are even larger in this case due to the absence of window rows on a freighter, among other reasons. The savings are validated using a software for fuel consumption analyses developed by Lufthansa Technik, which allows the effectiveness of a wide variety of different aircraft modifications to be demonstrated reliably based on comprehensive data.

Lufthansa Technik and BASF intend to continue developing the new technology

consistently to include additional aircraft types and even larger surfaces so that they can support airlines around the globe even more comprehensively in the future in reaching their sustainability goals. Initial model calculations show that use of sharkskin technology at its highest expansion level could reduce CO₂ emissions by as much as three percent.

About BASF:

At BASF, we create chemistry for a sustainable future. We combine economic success with environmental protection and social responsibility. More than 110,000 employees in the BASF Group contribute to the success of our customers in nearly all sectors and almost every country in the world. Our portfolio is organized into six segments: Chemicals, Materials, Industrial Solutions, Surface Technologies, Nutrition & Care and Agricultural Solutions. BASF generated sales of €59 billion in 2020. BASF shares are traded on the stock exchange in Frankfurt (BAS) and as American Depositary Receipts (BASFY) in the U.S. Further information at www.basf.com.

BASF's Coatings division:

The Coatings division of BASF is a global expert in the development, production and marketing of innovative and sustainable automotive OEM and refinish coatings, decorative paints as well as applied surface treatments for metal, plastic and glass substrates in a wide range of industries. The portfolio is supplemented by "Beyond Paint Solutions", which are aimed at developing new markets. We create advanced performance solutions and drive performance, design and new applications to meet our partners' needs all over the world. BASF shares skills, knowledge and resources of interdisciplinary and global teams for the benefit of customers by operating a collaborative network of sites in Europe, North America, South America and Asia Pacific. In 2020, the Coatings division achieved global sales of about €3.1 billion.

www.basf-coatings.com

Lufthansa Cargo AG:

With a turnover of 2.8 billion euros and a transport performance of 6.5 billion freight ton kilometers in 2020, Lufthansa Cargo is one of the world's leading companies in the transport of airfreight. The company currently employs around 4,400 people worldwide. Lufthansa Cargo's focus is on the airport-to-airport business. The route network covers around 300 destinations in more than 100 countries, using both freighter aircraft and cargo capacity from passenger aircraft operated by Deutsche Lufthansa, Austrian Airlines, Brussels Airlines, Eurowings and SunExpress, as well as trucks. The majority of the cargo business is handled via Frankfurt Airport. Lufthansa Cargo aligns

its corporate responsibility commitment with the sustainability goals of the United Nations (UN). Lufthansa Cargo has committed itself to anchoring five selected sustainability goals in its corporate activities and to making a substantial contribution to achieving these goals by the year 2030. Lufthansa Cargo is a wholly owned subsidiary of Deutsche Lufthansa AG and the specialist for the logistics business of the Lufthansa Group.

www.lufthansa-cargo.com

About Lufthansa Technik:

With some 35 subsidiaries and affiliates, the Lufthansa Technik Group is one of the leading providers of technical aircraft services in the world. Certified internationally as maintenance, production and design organization, the company has a workforce of more than 22,000 employees. Lufthansa Technik's portfolio covers the entire range of services for commercial and VIP/special mission aircraft, engines, components and landing gear in the areas of digital fleet support, maintenance, repair, overhaul, modification, completion and conversion as well as the manufacture of innovative cabin products.

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