Backgrounder

www.boeing.com

The Boeing ecoDemonstrator Program

Boeing launched the ecoDemonstrator program in 2012 to enable aviation's relentless pursuit to improve efficiency, minimize its environmental footprint and enhance safety. With successive airplane platforms, the ecoDemonstrator program takes promising technologies out of laboratories and tests them in an operational environment to help solve real-world challenges for airlines and passengers, and to help mitigate the climate impact of our industry.

A dedicated team of engineers and specialists supports the ecoDemonstrator program, which is part of the Boeing Commercial Airplanes Product Development organization. That team collaborates with experts throughout Boeing and the industry to select technologies to test onboard, which often takes years of preparation. Together, the team and technologists focus on a singular motto — "innovate, collaborate, accelerate" — to ensure they're supporting one another and the constant evolution of new ideas.

The Boeing ecoDemonstrator program has a legacy of bringing together customers, suppliers, government agencies, academia and other stakeholders to help test and advance sustainable technologies. Since the program's inception, engineers and scientists at Boeing and its ecoDemonstrator partners expanded the scope of research beyond reducing emissions and enhancing safety and operational efficiency, to assess new features, services and approaches that can improve the entire aviation ecosystem.

History

- Eleven airplanes have served as flying test beds for the ecoDemonstrator program including the 2024 program.

- Since the program began, the ecoDemonstrator program has evaluated more than 250 technologies – 28% have progressed onto our products and services, 52% are still being matured and 20% provided helpful learnings but were discontinued.
- Projects include technologies that reduce fuel use, emissions and noise, and incorporate more sustainable materials.
- ecoDemonstrator platforms have also tested cabin amenities that improve the passenger experience — features such as smart galleys and UV disinfection – in addition to products that increase schedule reliability and the efficiency of airline fleets and crews.
- The program also has pioneered alternative energy carriers. Our 2012 ecoDemonstrator tested regenerative hydrogen fuel cell technology for onboard auxiliary power to the galley. Our 2018 ecoDemonstrator conducted the first flight on a commercial airliner with 100% sustainable aviation fuel in both engines.

Here's a list of ecoDemonstrator platforms and some key partners:

2012: American Airlines 737-800
2014: Boeing 787-8 Dreamliner
2015: TUI 757
2016: Embraer E170
2018: FedEx 777 Freighter
2019 Boeing 777-200
2020: Etihad Airways 787-10
2021: Alaska Airlines 737-9
2022-2024: Boeing 777-200ER (Extended Range)
2023: Boeing 787-10 Dreamliner (Explorer)
2023: Boeing 737-10 (Explorer), destined for United Airlines

Newly delivered Boeing airplanes as well as many in today's global fleet include technologies that were evaluated and proven on the ecoDemonstrator program, such as:

- More aerodynamically efficient winglets on the 737 MAX

- iPad apps that provide pilots with real-time weather and other information, enabling them to improve fuel efficiency and reduce emissions
- Custom approach path information to lower community noise
- Flight deck touch-screen displays and a camera system on the 777X that enhance safety by helping pilots avoid ground obstacles

ecoDemonstrator Explorers

In 2023, Boeing expanded the program with "Explorer" airplanes which focus on short-term testing of an individual technology or project. They also provide added flexibility to our flight testing. In June 2023, the first ecoDemonstrator Explorer was a Boeing 787-10 Dreamliner which supported multi-regional trajectory-based operations testing with air traffic management agencies in Japan, Singapore, Thailand and the U.S. In October 2023, the second ecoDemonstrator Explorer, a Boeing 737-10 destined for United Airlines, supported flight tests to analyze sustainable aviation fuel emissions and their impact on contrail characteristics.

Sustainable Aviation Fuel

The ecoDemonstrator program has significantly benefitted the industry as a whole as Boeing has tested and advanced the use of sustainable aviation fuel (SAF). SAF reduces life-cycle CO_2 emissions by up to 84%. Every ecoDemonstrator platform has flown on SAF. The 2018 Boeing ecoDemonstrator program, in partnership with FedEx Express, made history by conducting the world's first commercial airliner test flight flown on 100% SAF in both engines. In recent years, a 30/70 blend of sustainable aviation fuel and conventional jet fuel was purchased to cover all the flights of each test-bed airplane, reinforcing the value of sustainable fuel and providing data for the industry and partners.

Boeing has committed that all commercial airplanes it delivers will be compatible with 100% SAF by 2030. This move supports the civil aviation industry's commitment to achieve net zero carbon emissions by 2050. The company's confidence in reaching these goals is based partially on the success of many flight tests by the ecoDemonstrator program.

In 2021, the program launched a multi-year partnership with the National Aeronautics and Space Administration (NASA) to collect and analyze data on SAF emissions, and the two partners began ground testing on engine particles and trace gas emissions with various blends of SAF on the 2021 ecoDemonstrator, an Alaska Airlines 737-9, conducted alongside a demonstration flight with 100% SAF in one engine. The following year, NASA and Boeing continued ground emissions testing with SAF on the 2022 ecoDemonstrator, a Boeing-owned 777-200ER (Extended Range) and a 787-10, as reported in Aviation Week. In 2023, the SAF emissions testing took to the skies with NASA's DC-8 Airborne Science Lab trailing behind the ecoDemonstrator Explorer, a 737-10 destined for United Airlines. The team of researchers measured emissions from 100% SAF and studied the fuel's impact on contrail characteristics, with the additional partners of the German Aerospace Center (DLR), GE Aerospace, and the Federal Aviation Administration.

2024 Technologies

The Boeing ecoDemonstrator program continued to leverage a 777-200ER to test new technologies focused on strengthening operational efficiency and sustainability in cabin interiors. These projects included:

- **Operational efficiency**: Enhanced capabilities of electronic flight bag application, Jeppesen's updated FliteDeck Pro, such as an algorithm providing in-flight advisories to improve fuel consumption, and the ability to use real-time and historical data to predict taxi times
- **Airport noise**: Quantifying the environmental benefits of flight operation procedures, such as steeper glide slope and continuous descent approach, to reduce community noise, fuel use and emissions
- **Waste-reducing materials**: "Deep-dyed" digitally printed carpet that reduces weight by 120 pounds (54 kilograms) on a 787-9. It also uses less water, energy and produces less waste in the manufacturing process

More information about the Boeing ecoDemonstrator program and previous flying test-bed airplanes can be found at boeing.com/ecoDemonstrator, and Boeing's sustainability commitments and partnerships at https://www.boeing.com/sustainability.

Contact:
Elisa Hahn
Boeing Communications
+1 206-482-4872
elisa.alfstad-hahn@boeing.com
Oct 2024