

NextGen Works for the Environment



NextGen protects and conserves the environment. The FAA works with industry on new technologies, products and procedures.

CLEEN Goals

The FAA initiated a five-year government-industry initiative in 2010, known as the Continuous Lower Energy, Emissions and Noise (CLEEN) program. The CLEEN Program is a NextGen effort to accelerate development and commercial deployment of environmentally promising aircraft technologies and sustainable alternative fuels.

The aircraft technologies focus on reduction in aircraft noise, emissions and fuel burn. Specific goals of the CLEEN program include development of:

- Certifiable aircraft technology that reduces aircraft fuel burn by 33 percent and reduces energy consumption and greenhouse gas emissions
- Certifiable engine technology that reduces nitrogen oxide emissions by 60 percent below International Civil Aviation Organization standards

- Certifiable aircraft technology that reduces noise levels by 32 dB
- “Drop in” sustainable alternative jet fuels in aircraft systems
- New technology for engine and aircraft retrofit to accelerate penetration into the commercial fleet

Sustainable Alternative Jet Fuels

Through the development of sustainable alternative drop-in jet fuels — fuel that does not require any modification to the aircraft engine or fueling infrastructure — the FAA is making progress toward our goal of having 1 billion gallons of alternative jet fuel in use by 2018. These new fuels will contribute to reduced carbon dioxide emissions and improved air quality, helping us reach our goal of carbon-neutral growth by 2020 (compared with 2005).

Seven fuels are in various stages of testing and development all meant to perform the same as Jet A (conventional jet fuel). Three of these have been approved for use.



- The first two are 50-50 blends of petroleum-based Jet A and alternative jet fuels created from either Fischer-Tropsch synthesis which can use natural gas, biomass or waste products or the hydroprocessing of vegetable and waste oils.
- The third fuel is a 90-10 blend of petroleum-based Jet A and an alternative jet fuel that is produced from sugars using a biological process.

Some of these fuels have the potential to reduce the life cycle carbon dioxide emissions of aviation operations by up to 90 percent. Depending on the feedstock used in their production, the cost of these alternative jet fuels could be competitive with existing petroleum-based products.

New Engine Technology

To help meet the CLEEN goals, the FAA is working with Boeing and engine manufacturers to reduce noise, emissions and fuel burn.

Boeing

Boeing is developing two technologies that could reduce aircraft fuel burn up to 2 percent.

- Adaptive Trailing-Edge deploys miniature flaps on the aircraft wing to improve aerodynamic efficiency and decrease noise during takeoff and approach.
- A Ceramic Matrix Composite (CMC) acoustic nozzle installed at the engine exhaust can withstand higher temperatures and is made of lighter weight material. It lowers fuel consumption and can accommodate acoustic treatments that reduce noise.

General Electric

General Electric (GE) has developed four technologies that will reduce engine fuel burn, emissions and noise:

- GE finished wind tunnel testing on the Open Rotor turbine engine. Fuel burn on a single-aisle aircraft may be reduced 26 percent with up to 15 dB noise reduction.
- Core engine tests have been completed on the Twin Annular Premixed Swirler II combustor.

Results show landing and take-off nitrogen oxide emissions were reduced by 60 percent, meeting one of the CLEEN goals. This combustor is expected to enter airline service in 2016.

- GE completed modeling of their Flight Management System-Engine Integration technology. This technology will reduce aircraft fuel burn through efficiencies gained by adaptive engine control, integrated vehicle health management, and integrated flight-propulsion control.

Honeywell

Honeywell is testing several technologies including new coatings, a higher temperature impeller, advanced seals and improved turbine cooling that will increase engine efficiency and reduce engine weight. The CLEEN technologies will contribute 5 percent toward an overall 15.7 percent reduction in fuel burn resulting from an engine upgrade relative to baseline engine technology. A test of an alternative jet fuel blended with Jet A demonstrated no clogging at cold temperatures.

Pratt & Whitney

Pratt & Whitney is developing and testing an ultra-high bypass ratio geared turbofan (GTF) engine and associated advanced technologies. GTF engine technologies will contribute to reduced aircraft noise and fuel consumption because of increased engine efficiency. This engine is projected to reduce single-aisle aircraft fuel consumption by 20 percent with a 25 dB noise reduction.

Rolls-Royce

Rolls-Royce is developing a Dual-Wall Turbine Airfoil and CMC Blade Track, technologies aimed at increasing thermal efficiency in the turbine section of the engine. Dual-wall turbine airfoils are projected to provide 20 percent or more reduction in cooling and increased operating temperature capability. The new blade tracks made from CMC material will offer more than a 50 percent reduction in engine cooling and weight savings compared to a metallic design. Technology benefits will produce up to a 1 percent reduction in fuel consumption.

